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WARM SPRINGS EXTENSION STUDY

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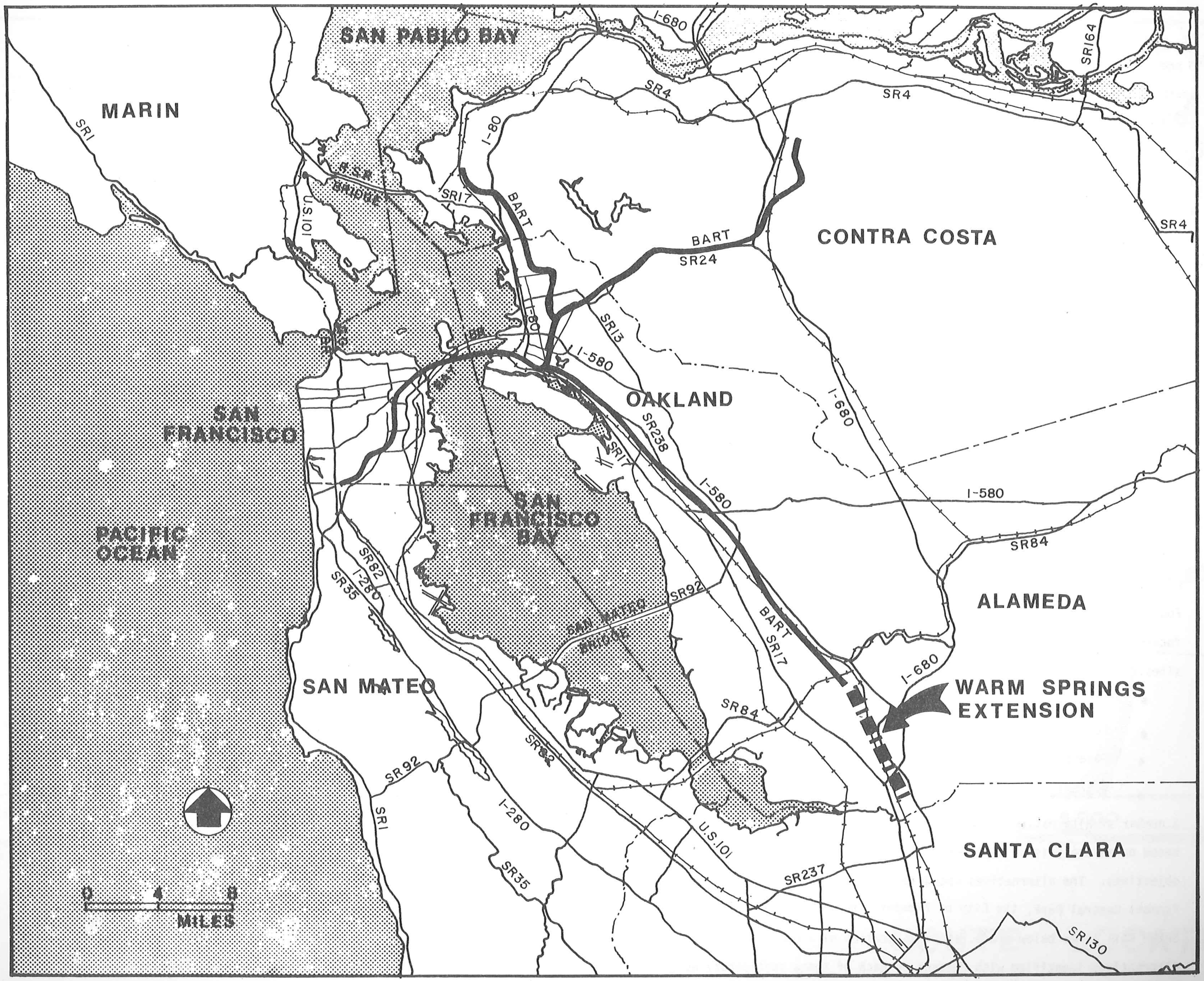
S.F. BART

Prepared by
BART, Department of Planning and Analysis
August, 1979
Report No. BAENG/ER-79/P005

AREA MAP


SAN PABLO BAY
I-680
SR164
SR4
SR4
MARIN
SR1
R.S.R. BRIDGE
SR17
I-80
BART
U.S.101
BART
SR24
CONTRA COSTA
SR4
I-80
SR13
I-580
OAKLAND
I-680
SAN FRANCISCO
SR238
SR17
I-580
I-580
PACIFIC OCEAN
SAN FRANCISCO BAY
SR84
SR82
I-280
SR35
SR92
SAN MATEO BRIDGE
BART
SR17
ALAMEDA
I-680
WARM SPRINGS EXTENSION
SAN MATEO
SR84
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SR82
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I-280
U.S.101
SR35
SR237
SANTA CLARA
SR130
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8
MILES

A preliminary engineering study investigating a possible BART extension south of the Fremont Station was initiated in February, 1979 as part of the BART/MTC Long Range Transit Development Project. The purpose of the study was to identify acceptable alignments and station locations so that a rail extension in this corridor could be evaluated relative to others in the region. The study recognized a number of important factors which favor a rail extension in this part of the Bay Area. These include:

- The attractiveness of incremental extensions one or two stations in length
- The potential benefits of relocating BART's Fremont line terminus adjacent to two major freeways
- The market potential of a rail extension within a rapidly expanding residential and commercial community
- The probable deletion of the SR-238 freeway through the City of Fremont
- The potential interface opportunities between BART and Santa Clara County Transit Services within the Nimitz and I-680 corridors.

The study was conducted by BART and co-ordinated with the City of Fremont, MTC and affected public and private utilities including the San Francisco Water Department, Southern Pacific and Western Pacific Railroads and the Alameda County Flood Control District.

Four basic issues were identified at the outset of the study. The investigation focused on these concerns as a means of identifying possible routes and station sites. The issues centered on:

- The relationship of a BART line to Fremont Central Park
- Local roadway grade separation plans
- Potential station sites and local planning goals
- The relationship of a BART line to the SP and WP Rail lines.

A number of alternative alignments and station locations were identified based on an analysis of engineering and impact criteria and local planning objectives. The alternatives recognize differences with regard to traversing Fremont Central Park, the City of Fremont's goal to depress the SP/WP Rail lines below grade, and the location of a new BART terminal. The alternatives identified with respect to each of these considerations include:

PARK ROUTING:

- An aerial direct line through Fremont Central Park and over Lake Elizabeth
- A subway direct line through Fremont Central Park and under Lake Elizabeth
- An aerial indirect line around all but one corner of Fremont Central Park

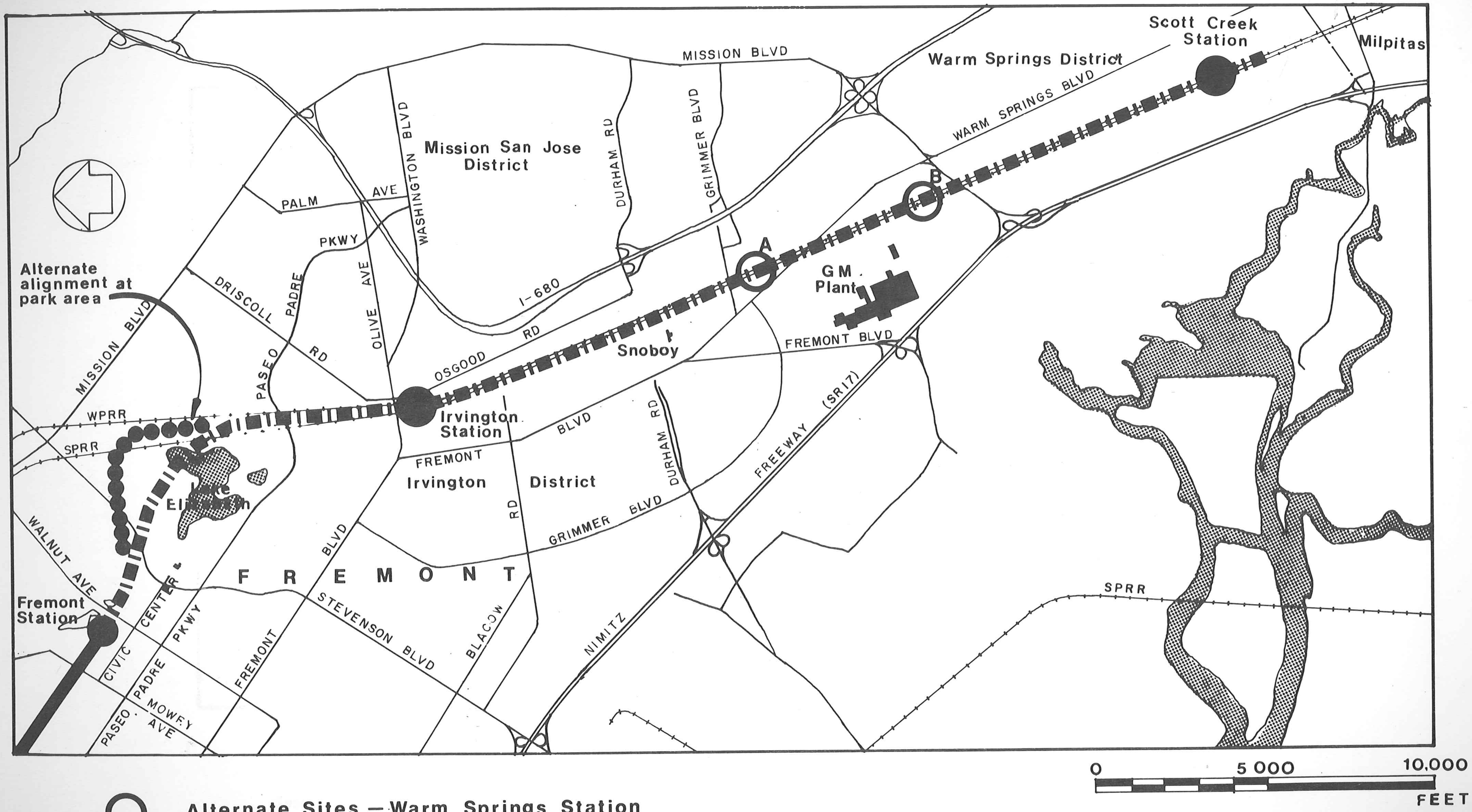
DEPRESSION OF SP/WP RAIL LINES AND GRADE SEPARATION PLANS:

- A minimum (3,800 foot) depressed rail corridor between Washington Blvd. and Durham Road
- An extended (9,300 foot) depressed rail corridor between Washington Blvd. and Durham Road

LOCATION OF A NEW BART TERMINAL STATION:

- A 4.8 mile extension with two new stations located at Washington Boulevard and Grimmer Road
- A 5.7 mile extension with two new stations located at Washington Boulevard (Irvington District) and Mission Boulevard
- A 7.1 mile extension with three new stations located at Washington Boulevard, Grimmer Road, and near Scott Creek Road

For cost estimating purposes, basic extension characteristics assumed a 4.8 mile line with an aerial direct routing through the Park, a minimum depressed SP/WP rail corridor between Washington Boulevard and Durham Road, and a new BART terminal at Grimmer Road. Incremental costs have been developed for each of the other alternatives. The following two tables summarize the financial and impact data with regard to each of the alternative alignments and station sites. Train service levels assume 6 minute frequency over the extension between 6 am and 7 pm on weekdays (alternating Richmond and Daly City trains at 12 minutes each) with 15 minute Fremont-Richmond service between 7 pm and 12 am.



○ **Alternate Sites — Warm Springs Station**

A — Grimmer

B — Mission

ROUTE LOCATION

FINANCIAL SUMMARY
(millions of 1979 dollars)

	EXTENSION ALTERNATIVES		
	4.8 Miles - Irvington and Grimmer Stations	5.7 Miles - Irvington and Mission Stations	7.1 Miles - Irvington, Grimmer & Scott Creek Stations
1. CAPITAL & CONSTRUCTION COST			
a. Baseline Extension Capital and Construction Costs for aerial direct route through park and minimum depressed rail corridor	174.0	181.4	217.7
b. Additional 2.4 million for aerial Indirect Route through Park (1)	176.4	183.8	220.1
c. Additional 19.5 million for Subway Route through Park (1)	193.5	200.9	237.2
d. Additional 25.6 million for Extended Depressed SP/WP Rail Corridor (1)	199.6	207.0	243.3
2. INCREMENTAL ANNUAL OPERATING COST	4.2	4.7	6.1
3. INCREMENTAL ANNUAL PASSENGER REVENUES	1.5	1.5	(not estimated)(2)
4. INCREMENTAL FAREBOX RATIO	35.7%	31.9%	(not estimated)(2)

NOTE: (1) The costs of constructing other track configurations can be estimated by mixing and matching elements b, c and d to the baseline alternative, number a.

(2) Patronage for a three station extension was not estimated since the Scott Creek Station alternative was added at a later date.

SUMMARY

EVALUATION FACTOR		SELECTED ALIGNMENTS				
		CENTRAL PARK ALIGNMENT ALTERNATIVES			SOUTHERN SEGMENT--SP/WP RAIL CORRIDOR	
		AERIAL OVER LAKE	SUBWAY UNDER LAKE	AERIAL AROUND LAKE	MINIMUM DEPRESSED	EXTENDED DEPRESSED
LOCAL COMMUNITY CONCERNS	LAND-USE COMPATIBILITY	In conflict with Fremont general plan on the basis of intrusion to open space.	Compatible with park environment but has been officially deleted from the City's land use plan (this holds true for all future BART routes throug Fremont Central Park).	In conflict with Fremont general plan on the basis of intrusion to open space. This route is preferred to aerial over lake route.	Conforms with Fremont general plan on the basis of confining rail operations to an already established corridor.	Conforms with Fremont general plan on the basis of confining rail operations to an already established corridor.
	COMMUNITY CIRCULATION	Minimal impact. Guideway permits through pedestrian, bicycle, boat, and maintenance vehicle access.	No impact with underground operation.	Minimal impact. Guideway permits through pedestrian, bicycle, and maintenance vehicle access.	Minimal impact. SP and WP are a significant barrier even without BART. Through traffic will be accommodated per grade separation plans.	Minimal impact. SP and WP are a significant barrier even without BART. Through traffic will be accommodated' per grade separation plans.
	STATION ACCESS	(not applicable)	(not applicable)	(not applicable)	(not applicable)	(not applicable)
	CONSTRUCTION DISRUPTION	Considerable disruption estimated over a one year period. Significant noise and dust impact.	Considerable disruption estimated over a two year period. Significant noise and dust impact.	Considerable disruption estimated over a 1½ year period. Significant noise and dust impact.	Minimal traffic disruption to pedestrians, auto, bicycles, and railroads. Considerable noise and dust impact to residential areas during daytime Three year construction time.	Minimal traffic disruption to pedestrians, auto, bicycles, and railroads. Considerable noise and dust impact to residential areas during daytime Four year construction time.
	DISPLACEMENT	Minimal park right of way required for aerial support structures.	No displacement of park property. Minimal impact for subway approach north of Stevenson Blvd.	Minimal park right of way required for aerial supports. Will require relocation of baseball field.	No impact other than at specified station locations.	No impact other than at specified station locations.
	NOISE (assumes guideway sound barriers and uses CNEL and average hourly ratings)	Some impact to Alpha land and park particularly over lake where guideway clearance and curve are responsible for higher noise generation.	Some impact to Alpha land but less than for the aerial routes. No impact through park.	Some impact to Alpha land and to Mission Valley residential area but less than for other aerial route. Minimal through park due to slower speeds around curve.	Positive impact to those locations where rails are below grade.	Significant positive improvement between Paseo Padre Blv and Durham Rd where rails ar below grade.
	VISUAL AESTHETICS	Significant impact particularly for high structural clearance over lake.	Minimal impact north of Stevenson Blvd. No impact south of Stevenson Blvd.	Significant impact but to a lesser degree than for the aerial route over the lake. Skirts perimeter of the park.	Minimal impact south of Durham Rd. Positive impact north of Durham where rails are to be below grade.	Minimal impact south of Durham Rd. Significant positive impact north of Durham where rails are to be below grade.
REGIONAL CONCERNS	TRAVEL ACCOMMODATION	A Warm Springs BART extension is expected to capture a sizeable portion of the large growth of regional travel forecast to occur in this corridor. Vastly improved freeway access in conjunction with Santa Clara transit improvements will establish a much more attractive transit link between the San Francisco-Oakland regional core and South Bay communities Opportunities also exist to improve transit access between the Livermore-Pleasonton area and the Santa Clara Valley via I-680. A Warm Springs extension station (the BART terminal) would provide a focal point for regional transit where inter-county transfers could easily be accommodated.				
	AIR QUALITY	A Warm Springs BART extension alone will not significantly improve the region's air quality. The number of vehicle miles generated by automobiles which the extension is projected to capture is insignificant compared to total regional travel. This project in terms of a total transit package however, should account for significant incremental benefit.				
	ENERGY USE	(Same as for Air Quality)				

EVALUATION

EVALUATION FACTOR		SELECTED STATION SITES			
		IRVINGTON	WARM SPRINGS ALTERNATIVES		3 STATION LINE
		WASHINGTON BOULEVARD	GRIMMER BOULEVARD	MISSION BOULEVARD	SCOTT CREEK ROAD
LOCAL COMMUNITY CONCERNS	LAND-USE COMPATIBILITY	Conforms to Fremont general plan which identifies a future rapid transit station at this location	City's general plan does not show a rapid transit station at this location. This site, however, is compatible with surrounding industrial land uses.	Compatible with surrounding land-use. Fremont general plan, however, shows station site in the vicinity of Mission Blvd and Warren.	City's general plan does not show a rapid transit station at this location. This site however, is compatible with surrounding industrial land uses.
	COMMUNITY CIRCULATION	Surrounding residential areas provide strong ped-bike access demand. Assumes local bus improvements generating 30 to 40 peak hour buses at station	Very little ped-bike access. Strong transit access demand from Santa Clara county at 50 to 60 peak hour buses at station (includes local buses) Good GM plant access.	Very little ped-bike access. Strong transit access demand from Santa Clara county at 50 to 60 peak hour buses at station (includes local buses) Good GM plant access.	Very little ped-bike access. Strong transit access demand from Santa Clara county at 50 to 60 peak hour buses at station (includes local buses).
	STATION ACCESS	1055 auto trips during each two hour peak period. 1655 auto trips during off-peak. 1200 parking spaces total with 900 required for morning two hour peak.	685 auto trips during each two hour peak period. 1300 auto trips during off-peak. 1000 parking spaces total with 620 required for morning two hour peak.	685 auto trips during each two hour peak period. 1300 auto trips during off-peak. 1000parking spaces total with 620 required for morning two hour peak.	(A three station extension has not been analyzed. Indications are that this sta- would generate similar levels of traffic as Mission Blvd)
	CONSTRUCTION DISRUPTION	Significant impact. Some noise and dust within commercial and residential areas.	Minimal impact. Some noise and dust within industrial areas.	Minimal impact. Some noise and dust within industrial areas.	Minimal impact. Some noise and dust within industrial areas.
	DISPLACEMENT	Depressed rail right of way would result in some commercial displacement even without BART. Two businesses would be removed.	Presently undeveloped agricultural land to be rezoned industrial this summer.	Primarily undeveloped industrial lands. Two residential properties would be displaced by the station.	Undeveloped industrial lands. One existing business would be removed.
	NOISE (assumes guideway sound barriers and uses CNEL and average hourly ratings)	Minimal impact from added auto/bus traffic due to high ambient noise levels form SP/WP, Washington Blvd, Osgood Rd. and Fremont Blvd.	No impact. Within industrial land-use area.	No impact. Within industrial land-use area.	No impact. Within industrial land-use area.
	VISUAL AESTHETICS	Low profile due to depressed rail right of way. Landscaping will minimize parking area impact.	Minimal impact. Within industrial land-use area. At grade alignment ensures low profile.	Minimal impact. Within industrial land-use area. At grade alignment ensures low profile.	Minimal impact. Within industrial land-use area. At grade alignment ensures low profile.
REGIONAL CONCERNS	TRAVEL ACCOMMODATION	Analysis of travel data indicates that a two station extension to Warm Springs is expected to accommodate 12,000 average week-day trips. Of this amount 3,200 would be new BART trips resulting from increased system accessibility. The remaining 8,800 trips are diverted trips from the Fremont station to the new extension stations. Patronage for a three station extension to Scott Creek (near the Alameda-Santa Clara county line) has not been analyzed.			
	AIR QUALITY				
	ENERGY USE				

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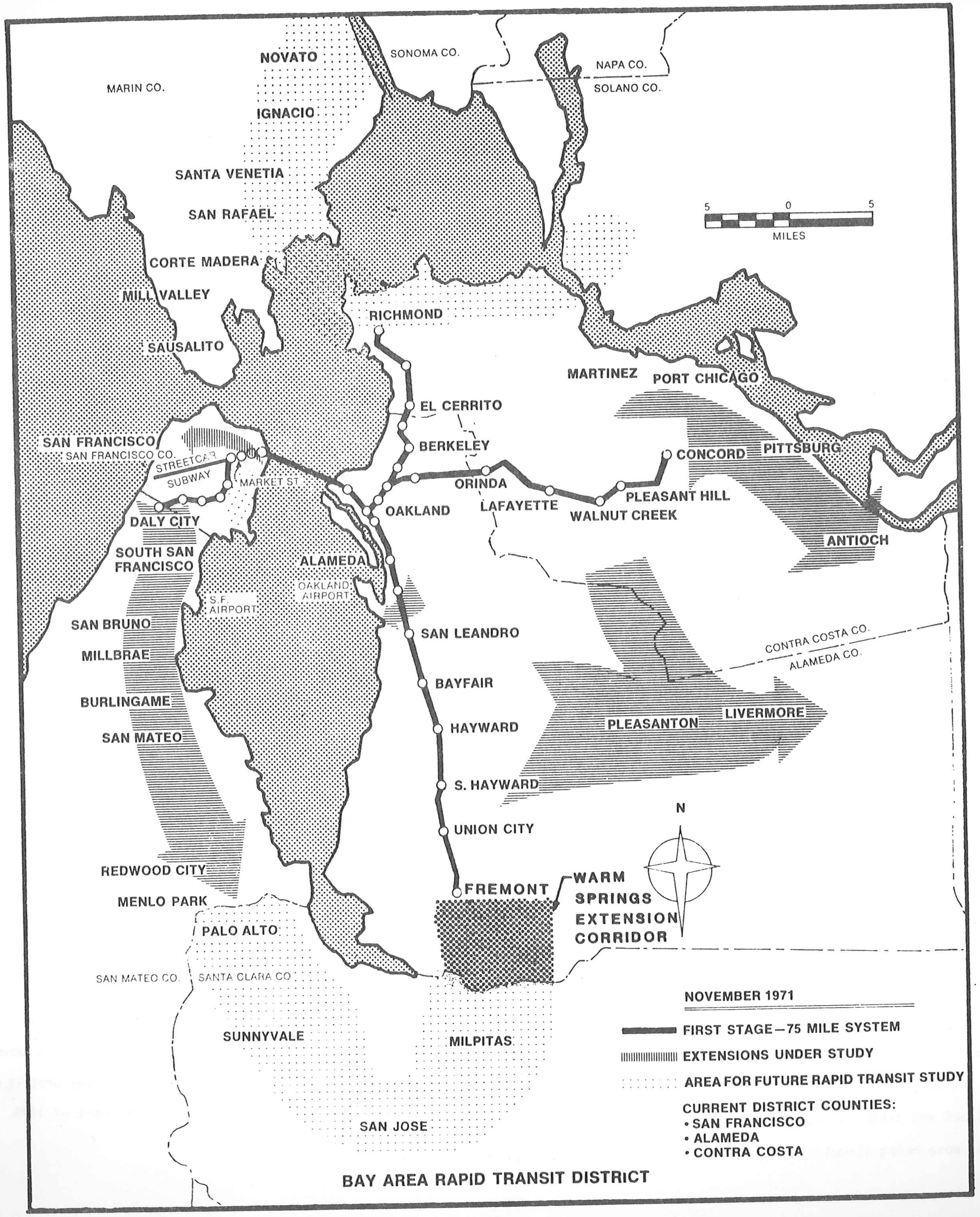


BAY AREA RAPID TRANSIT DISTRICT

The creation of the Bay Area Rapid Transit District (BARTD) in 1957 was largely the result of a recognized need for a balanced regional transportation system. Arguments in favor of establishing a regional rail system hinged on the fact that highways alone could not be expected to accommodate the travel needs of a rapidly expanding population and economic base. To do so would require large amounts of urban space dedicated primarily for the purpose of moving automobiles rather than people. This was perceived as a threat to the integrity of established Bay Area communities where increasing land demands needed for the movement and storage of autos already had resulted in a dramatic impact to landscapes and lifestyles. Unlike most areas situated on the Bay Plain, growth in southwestern Alameda county and adjacent portions of Santa Clara county is a relatively new phenomenon oriented almost totally around the automobile. As one of the fastest growing areas in the state and nation, it is clear that transportation solutions other than just highways will be required to meet future travel demands. The BART Commission recognized the possibility of this occurrence and accordingly recommended in its 1956 report to the state legislature that the initial BART system be extended around the South Bay as part of a second-stage program.

Almost a quarter of a century has passed since the BART Commission submitted its formal recommendations to the state. The years since that time have been marked by a rapid secession of agricultural lands as a prelude to urban expansion. Increasingly large numbers of people and their automobiles, the invention that permitted low density suburbs to be a viable life style, moved into the South Bay and with it brought a new demand for more and better roadways. First came the Nimitz Freeway, the East Bay's direct link with San Jose; then Interstate 680 was constructed connecting the South Bay to central Alameda and Contra Costa counties. Time went on; more people moved in; more traffic generated; more plans formulated. One of these plans called for a new freeway generally following Mission Boulevard: the SR-238 freeway. This facility was to provide an alternate route to the Nimitz by closing the gap between I-680 and I-580 in Hayward. Meanwhile, regional rapid transit extension plans were being formulated. BART participated in a number of extension studies in the early 1970's which investigated the feasibility of extending its lines within the three-county district as well as into San Mateo county. The results of the effort were bound between the covers of six individual reports addressing the potential benefits of rail rapid transit within six Bay Area travel corridors. A follow-up project charged with the responsibility of placing the six studies in an evaluative framework was initiated in 1976; the BART/MTC Long-Range Transit Development Project. By mid-1978, it became clear that a BART extension to the Warm Springs district of Fremont would need to be incorporated into this work. The reasons underlying this decision include:

- ? The increasing attractiveness of incremental extensions in view of limited funding sources.
- The potential benefits of relocating a BART terminus adjacent to two major freeways.
- The market potential of a rail extension in view of the areas projected growth.
- ? The recommended deletion of the SR-238 freeway from the state freeway implementation program.
- ? Imminent development plans which could threaten the integrity of a future BART extension south of the existing Fremont station.
- A potential interface with major transit improvements planned for in Santa Clara county.

The Warm Springs BART Extension Study was thus initiated in February 1979 for the purpose of identifying acceptable alignments and station locations along with a determination of costs and impacts. The primary intention is to provide an information base comparable to the six previously studies travel corridors. The results of this study will then be used by the BART Board of Directors in its consideration of future extensions and the formulation of right-of-way protection policies. This is expected to take place during the latter part of 1979.

Since its incorporation in 1956, the City of Fremont has grown rapidly in population from 22,800 persons to about 7.6%/yr 125,000 presently. The City's growth coupled with that occurring in the greater San Jose area has resulted in the South Bay's status as one of the fastest developing areas in the nation. According to a recent ABAG estimate (Projections '79), Fremont is expected to house an additional 2.5%/yr 62,000 people above the current level of population by the year 1995. The primary factors cited for this gain include:

- Limited supply of close-in land available for residential use in the Bay Area.
- Industrial expansion occurring in Fremont and greater San Jose.
- Local and regional infrastructure including better access to the Peninsula as a result of Dumbarton Bridge improvements, availability of AC, Santa Clara and BART transit services, and numerous roadway improvements.

With the primary limiting factors of water and sewerage capacity, the City of Fremont is expected to have an ultimate capacity to house 194,000 people. This level of population is expected to be attained by the year 2000. Currently, 74% of the city's housing stock consists of single-family detached dwellings. Compared to today, the scarcity of developable land located between the hills and bay will result in somewhat higher densities when full capacity is attained. At full development, city staff has estimated that Fremont will consist of 63% single family detached dwellings. The employment side of the picture reveals similar growth characteristics. Fremont currently contains approximately 37,000 jobs. With a commercial and industrial reserve of about 5,500 acres, the city has the potential of nearly 3.4%/yr doubling its current employment count by the year 2000. Recent ABAG estimates place Fremont's 1995 employment at 57,000 jobs. Whereas, most of the added residential development is forecast to occur in close proximity but away from the rail corridor under study, a large percentage of the added commercial and industrial development will take place on property directly adjoining the corridor.

Underlying this pattern of development is an assumption concerning mobility; the ability to move between home, work, school, shopping areas and a host of other activities requiring travel. City projections for travel on its major arterials and freeways indicate a growth rate reflecting the pattern of development described. A November 1978 traffic study by TJKM Consultants revealed that Mission Boulevard, for example, is projected to carry as much daily traffic in 1995 as the Nimitz Freeway currently carries through the Warm Springs district: 66,000 vehicles each day. The traffic volume along the Nimitz is projected to nearly double along all segments of this freeway through Fremont compared to today's figures. Other arterials will experience similar gains driven by more people needing to travel to more places. While overall, this can be interpreted as a healthy situation in terms of economic activity, the other side of the coin reveals a variety of impacts which are unquestionably unhealthy, namely: higher levels of pullutant emissions, added noise, and further reliance on a fossil-fuel mode of transport.

In an attempt to ease traffic movement and also to enhance the community environment, the City has proposed the implementation of a depressed rail corridor in conjunction with roadway extensions and grade separations. Two projects to be implemented in the near future are the Grimmer Road undercrossing and Durham Road overcrossing. Both roadways are to be extended, closing gaps between easterly and westerly portions which are currently cut off by the SP/WP tracks. Other grade separation projects assumed in this study include:

- Paseo Padre Parkway (overpass).
- Washington Boulevard (bridge over depressed rail corridor)
- Blacow Road (undetermined configuration).
- Warren Avenue (undetermined configuration).

The Washington Boulevard and Blacow Road projects are directly linked to the proposed depressed rail corridor. Under this plan, the SP would abandon its mainline from approximately Durham Road northward as part of a consolidation arrangement with the WP. BART presumably could occupy a portion of this abandoned right-of-way. South of Durham Road, the single consolidated line would branch into two separate rail lines. The SP would be parallel and to the west of the WP.

From a regional perspective, the Warm Springs corridor forms a vital link between the older industrial East Bay communities to the north and the rapidly expanding Santa Clara Valley to the south. This larger travel corridor is referred to in the Metropolitan Transportation Commission (MTC) regional transportation plan as the East Bay corridor stretching from Richmond to San Jose and centering on the SR-17 and I-80 freeways. Presently, there is a large out-commute from the Fremont area to employment areas located within the San Francisco-Oakland regional core. Recent indications are, however, that the magnitude of the southbound out-commute will grow in proportion to employment expansion in the Santa Clara Valley. The total out-commute impact should be tempered somewhat by the additional jobs projected to be established within Fremont. To the extent that commuting is an inherent feature of all large metropolitan areas, employment growth in Fremont as well as the Santa Clara Valley will create a demand for access improvements to these areas from other parts of the Bay Area.

A recent study addressing the future transportation needs in the Santa Clara Valley indicates a very rapid growth rate for travel across the Alameda-Santa Clara county line. Near-term transit improvements recommended by the study include extensive express-bus service between the Santa Clara Valley and the BART terminus at Fremont. This service will not only provide Santa Clara residents with direct transit access to Fremont and the BART system but it will also function as a regional transit link for BART district residents to the expanding employment opportunities in the Santa Clara Valley. The attractiveness of this service and its resulting effectiveness will largely be dependent upon travel time as realized by the level of bus access to the BART terminus. Just as reducing the impedance in an electrical circuit will increase the flow of current, eliminating travel resistance factors should result in a higher flow of transit patrons. At a distance of almost three miles from the Nimitz Freeway, the present BART terminus in Fremont relies on major city arterials as its only access routes. These same roadways are forecast by Fremont to carry very high levels of traffic in the near future.

BART extensions have been the topic of numerous studies as was pointed out earlier in this report. Each carries with it a slightly different impact in terms of daily operations, patronage, revenues, costs and public image; social environmental factors notwithstanding. A primary objective is to offer convenient and effective service to the traveling public while adhering to a fiscally responsible budget. The latter consideration is particularly crucial given increasing competitiveness for public funds. As a consequence of this, BART as a public organization charged with a specific purpose, must continually investigate ways of improving its service in response to the travel needs of district residents as well as the larger Bay Area. In its investigation, each potential improvement must be evaluated against a variety of factors addressing engineering and cost considerations as well as factors relating to social and environmental issues. Within this context,a number of crucial questions emerge relating to the implementation, operation and maintenance of a proposed rail improvement. These questions focus on:

- The feasibility of physically designing an extension within a given right-of-way.
- The operational impact of extending rail service over a new segment relative to the rest of the system.
- The fiscal impact of operating extension service.
- The return on the investment as realized by added patron utilization.

This study attempts to provide answers to these questions by investigating possible alignments preferred by local concerns as well as BART; identifying the costs for constructing, operating and maintaining the service; and finally evaluating the service relative to social, economic, environmental and land-use factors.

The design of the Warm Springs Extension Study was largely determined by the needs and timing of its parent study: the BART/MTC Long-Range Transit Development Project. Five basic steps were identified which were performed within a 15-week period commencing in February 1979. The steps include:

1. The identification of critical local issues.
2. The identification of preliminary alignments and station locations.
3. An evaluation of the preliminary alignments and station locations per local, regional, and BART criteria.
4. Refinement of the alignments and station locations (an iterative process was followed between steps three and four).
5. Determination of capital and construction costs associated with each selected alignment.

The study was coordinated among the participating BART departments with continuous input from the City of Fremont and MTC. Affected public and private concerns were also consulted during the course of the study. These include the Western Pacific and Southern Pacific railroads, the San Francisco Water Department, Alameda County Flood Control District as well as various departments within the City of Fremont.

STEP 1: CRITICAL LOCAL ISSUES

Within the context of the factors responsible for the study's initiation cited on page __, four critical issues were identified from Fremont's perspective.

- The Relationship of BART to Central Park. The Fremont General Plan specifies for the development of a large public open space located southeast of the Fremont BART station. The original SR-238 plans called for a below grade freeway west of Stevenson Boulevard and a bridge over Lake Elizabeth in Central Park with the assumption that a future BART line would occupy an adjacent parallel position. With the probable deletion of this freeway, based on environmental grounds, a full assessment of a BART line through Central Park will need to be developed. This issue thus focuses on BART's relationship to the park and adjacent environmentally sensitive areas for the specific purpose of weighing the costs of an underground line relative to the impacts of above-grade operation.

- Roadway Grade Separation Plans. A general assumption throughout the study was that a future BART line would occupy a portion of the SP and WP right-of-way which runs in a north/south direction through the city. This is based on the City's desire to consolidate rail facilities and also on the availability of land for right-of-way purposes. Since the city has a number of roadway grade separation projects programmed for implementation, these plans needed to be reviewed to determine whether a BART line could physically fit into the overall scheme. Additional concerns focused on other potential grade separation projects and how they would impact a BART line. The City also expressed its desire to implement a depressed rail corridor through the Irvington district as a means of enhancing the environment and facilitating grade separation projects in that area. A BART extension would need to be designed to fit into this plan as well.

- Potential Station Sites. This issue focuses on the compatibility between BART stations and desired land-use patterns. An important aspect is accessibility in relation to the expected demands that a station may exert on local streets and arterials. The identification of preferred sites will require a consideration of land availability, blending with surrounding environment, local street circulation, freeway access, pedestrian circulation and safety, displacement of residences and businesses and potential noise impacts.

- Relationship of BART to SP/WP Rail Lines. Incorporating BART within an already established rail corridor appears to minimize most potential adverse impacts while at the same time fitting into the city's long-term land-use plans. An important issue, however, is the specific location of the BART guideway relative to the SP and WP tracks. The primary objective here is to arrive at a compatible track configuration such that SP and WP freight operations can be maintained without interference and expanded to future industrial sites as required.

STEP 2: PRELIMINARY ALIGNMENTS AND STATION LOCATIONS

Starting with a general alignment concept, the study team developed preliminary alignment plans and station locations based on discussions between BART and the City of Fremont. The discussions focused on the four issues as described in the previous section. This information is presented in parts IV and V of this report.

STEP 3: EVALUATION PHASE

Based on primary concerns expressed by the City of Fremont, MTC, and BART, a set of criteria was developed addressing local, regional, and BART operational concerns. These were then applied to the preliminary alignments and station locations. These factors are listed below.

Local Criteria	Regional Criteria	BART Criteria
● Land use compatibility ● Community circulation impact ● Station access impact ● Construction impact ● Noise impact ● Visual impact	● Travel impact ● Air quality impact ● Energy use impact	● Patronage ● Operating Cost ● Capital Cost ● Speed profile ● Other design factors

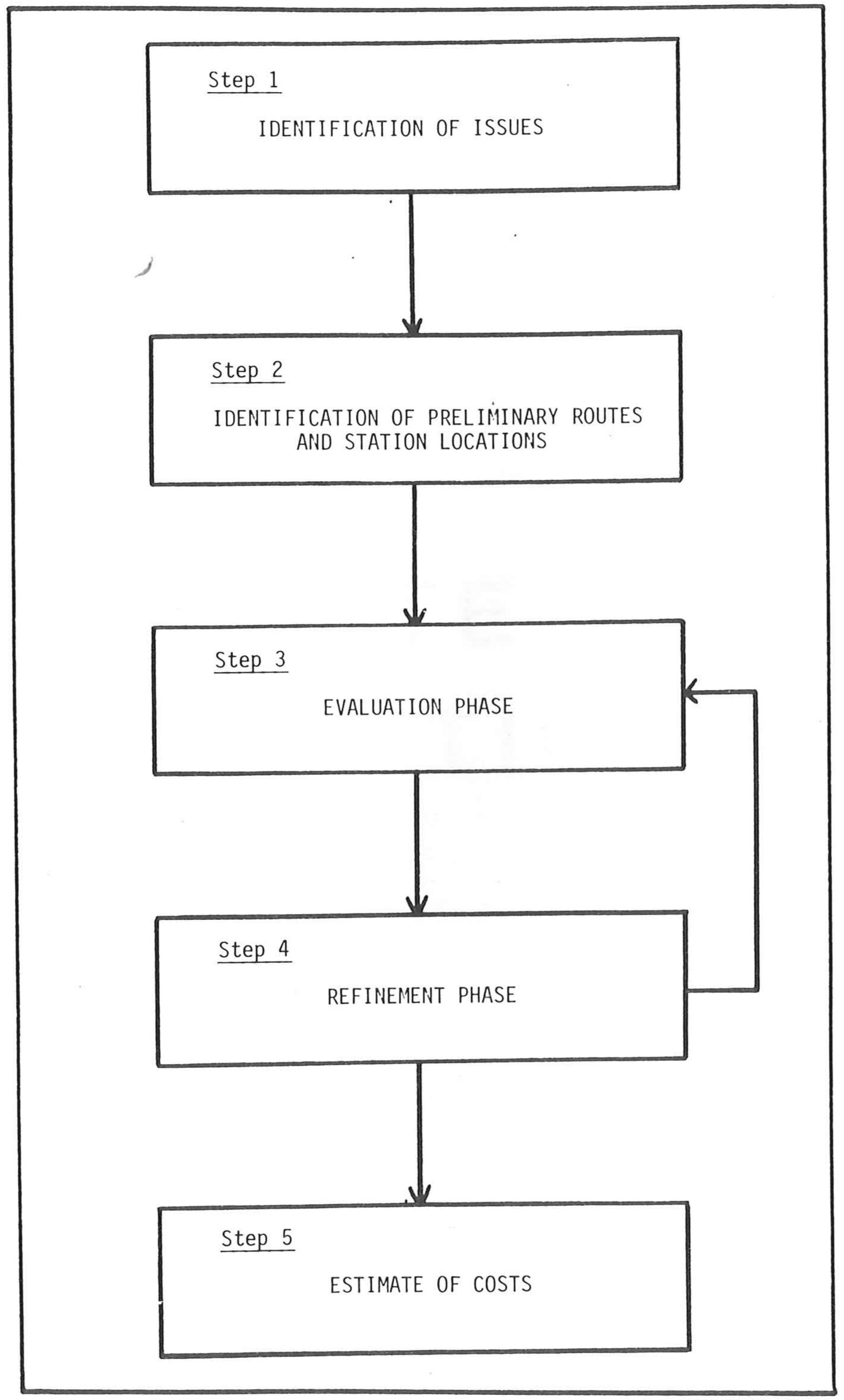
STEP 4: REFINEMENT PHASE

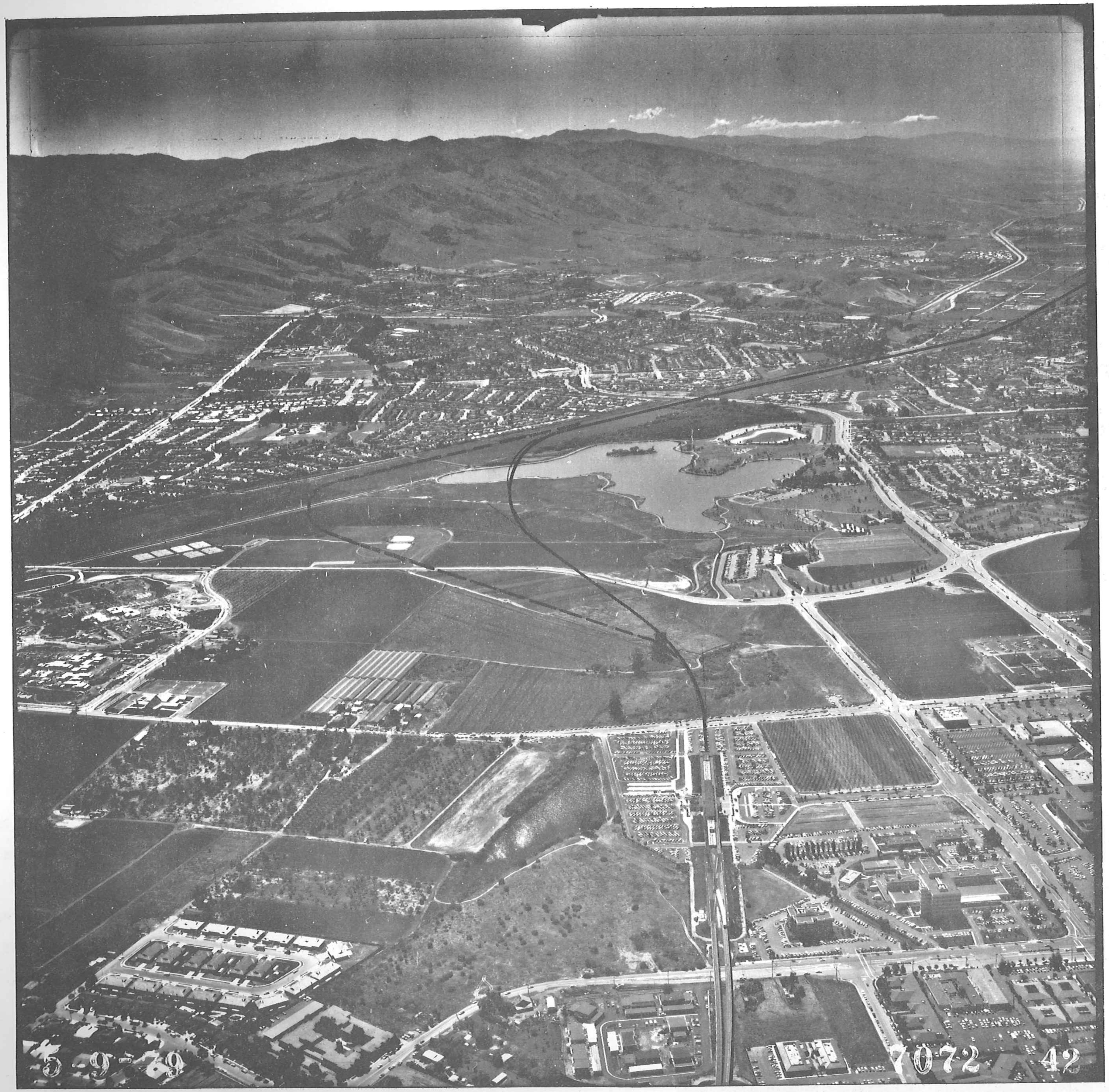
Following the evaluation of the preliminary alignments and station locations, appropriate revisions were made reflecting the desire to minimize adverse impacts, including those which may affect public and private utilities. These revisions were then recycled through the evaluation phase until acceptable alignment and station location definitions were identified.

STEP 5: COST ESTIMATES

The final alignments and station locations were then used as the basis for developing capital and construction cost estimates.

BART WARM SPRINGS EXTENSION STUDY PROCESS





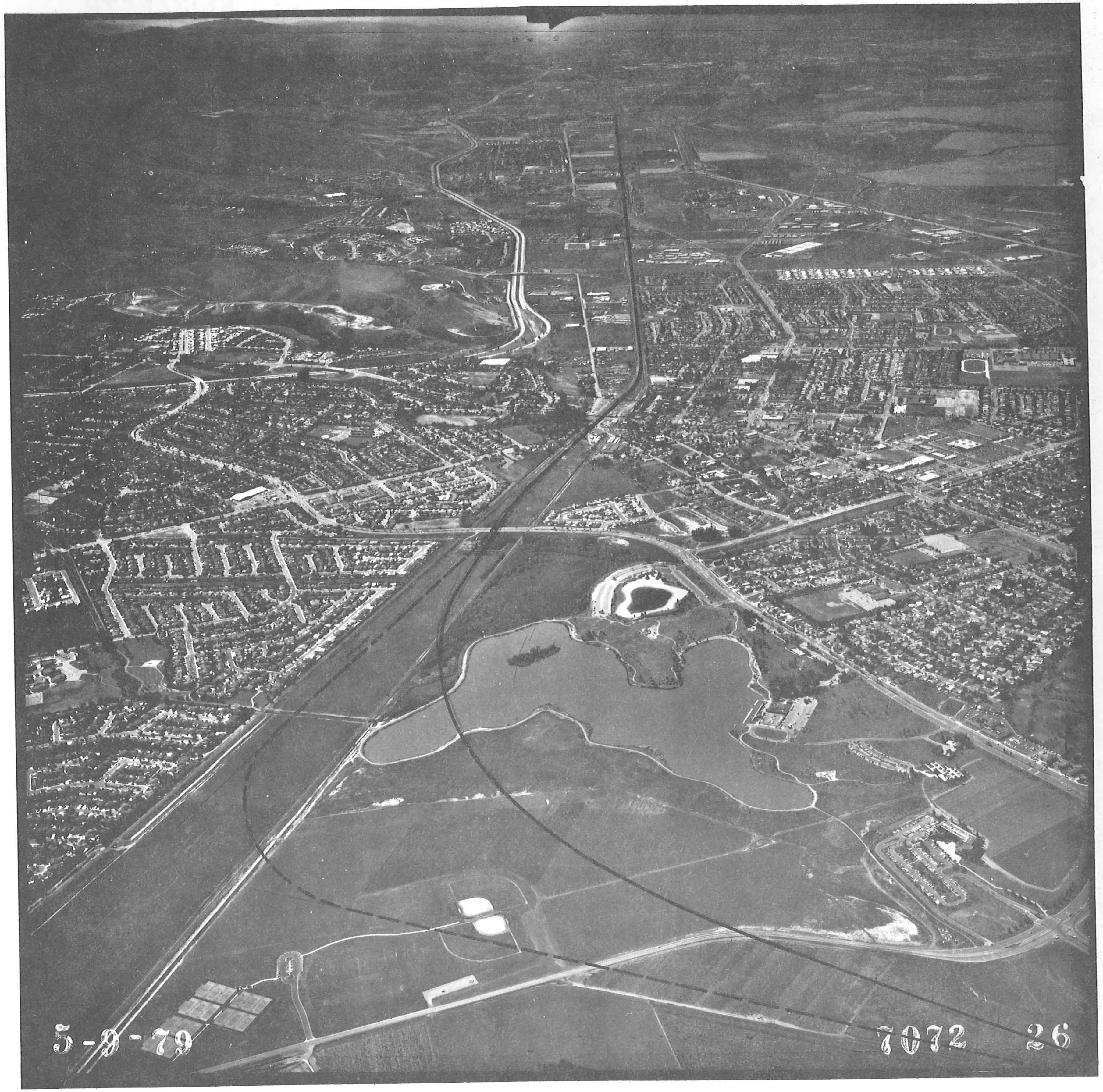
SOUTHEAST VIEW OF LAKE ELIZABETH, FREMONT CENTRAL PARK AND SURROUNDING RESIDENTIAL AREAS SHOWING ALTERNATE ALIGNMENTS. FREMONT STATION IS IN LOWER RIGHT OF PHOTO.

A general assumption accepted from the outset of the study was that a future BART extension through the City of Fremont would follow the SP/WP right-of-way. This stems from the City's desire to contain rail activities to a single corridor in a manner consistent with land-use plans. While giving due consideration to the development of a vital community service, this pattern of rail service is viewed as an effective means of minimizing adverse community impacts. The present BART terminus, however, does not lie within the SP/WP corridor. Rather, it is situated one mile to the west with environmentally sensitive lands, including a future residential area and Fremont Central Park, located in the path of any future BART extension. As a result of this situation, the alignment investigation is divided into two parts. The first focuses within the previously mentioned sensitive area and is referred to as the park segment. South of Paseo Padre Parkway, attention is given to identifying a BART route within an established rail corridor in such a way as to not interfere with current or planned SP and WP rail operations. This portion of the BART extension alignment is referred to as the southern segment.

PARK SEGMENT: FREMONT STATION TO PASEO PADRE PARKWAY

Three alternative alignments were developed for this portion of the extension which consider a variety of environmental, community and engineering factors. The three alternatives all lie to the east of the Fremont Civic Center. Alignments passing to the west of the Civic Center were considered undesirable on the basis of their potential displacement and noise impacts to existing development. Basic to each alternative, lying east of the Civic Center, are the underlying development assumptions for this portion of Fremont. These assumptions include:

- The deletion of the SR-238 freeway.
- Protection of a rapid transit corridor between Stevenson Boulevard and Walnut Avenue.

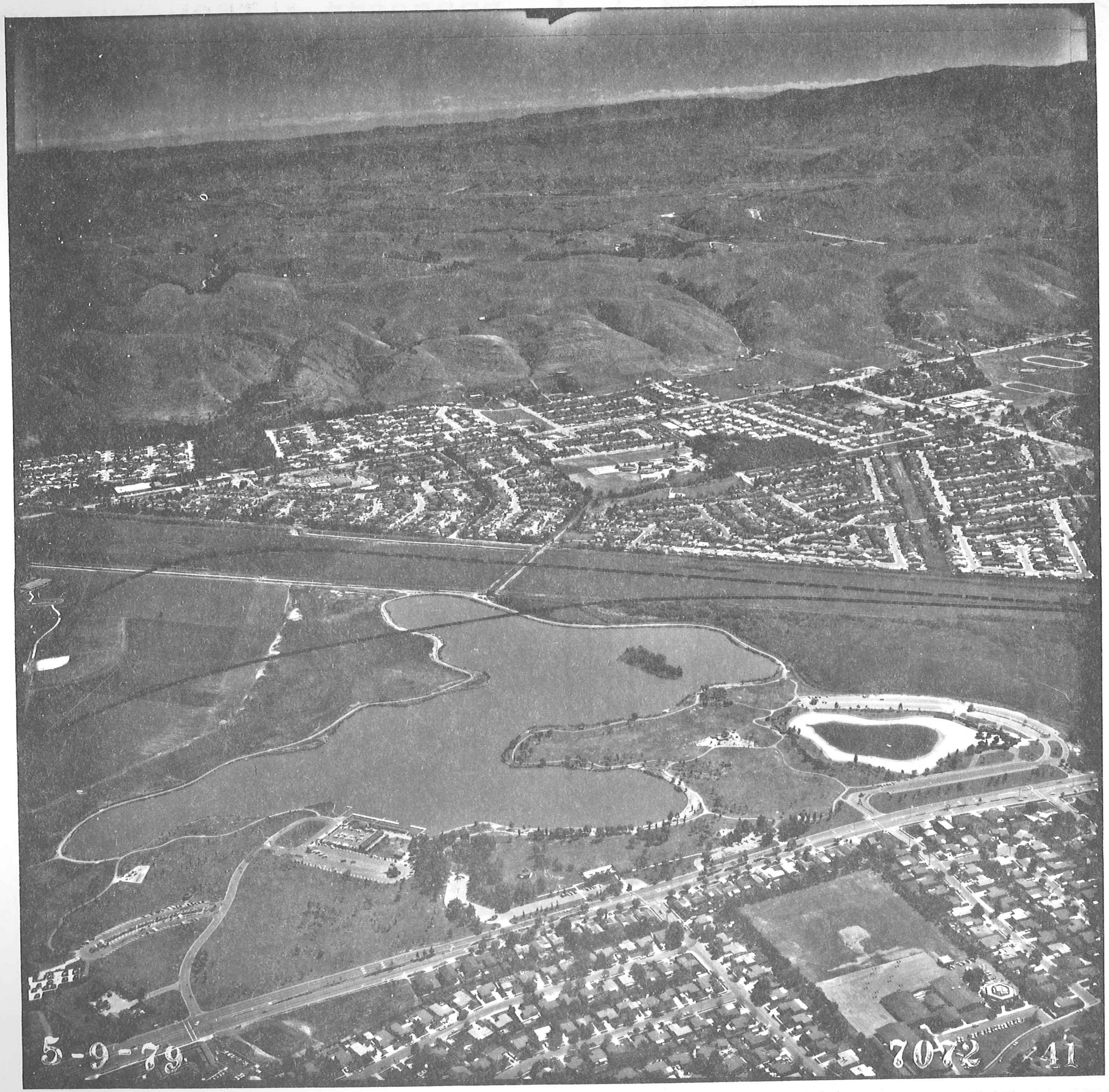


SOUTH VIEW OF LAKE ELIZABETH, FREMONT CENTRAL PARK AND SURROUNDING AREAS SHOWING ALTERNATE ALIGNMENTS.

- Future park plans including ultimate boundaries, roadways, lake configuration, and major facility sites.
- The abandonment of the SP mainline in accordance with current rail consolidation efforts between the SP and WP.
- Other development plans and considerations as identified by the Alameda Flood Control District and the San Francisco Water Department.

PARK SEGMENT ALTERNATIVE: AERIAL DIRECT

This alignment represents a least-cost approach to extending BART while attempting to maintain the integrity of the park environment. The alignment begins at the Fremont station in embankment with a transition to aerial structure prior to crossing Stevenson Boulevard. After crossing Walnut Avenue in bridge configuration, the line curves to the east, traversing the Hayward Fault in embankment then reverses south slightly prior to crossing Stevenson Boulevard in an aerial configuration. Maximum speed between the Fremont station and Stevenson Boulevard is 36 miles per hour. After crossing 15-feet above Stevenson Boulevard, the aerial alignment continues in a southeasterly direction, gradually increasing in elevation above the ground line in order to provide a 35 foot clearance between the top of the rail and the mean high water mark of Lake Elizabeth. This height was suggested by the Fremont Recreation Department to permit full use of the lake by its sailboats. The aerial alignment traverses a 3,000 foot curve to the south over the lake and continues this arc while descending to grade at a rate of 3% to a position 250-feet west of the consolidated SP/WP mainline. This location is approximately 250-feet north of Paseo Padre Parkway immediately adjacent to the San Francisco Water Department's Hetch Hetchy pumping facility. Maximum train speeds between Paseo Padre Parkway and Stevenson Boulevard can be programmed for 80 miles per hour, given the described track profile. The total length of this segment is 8,600 feet.



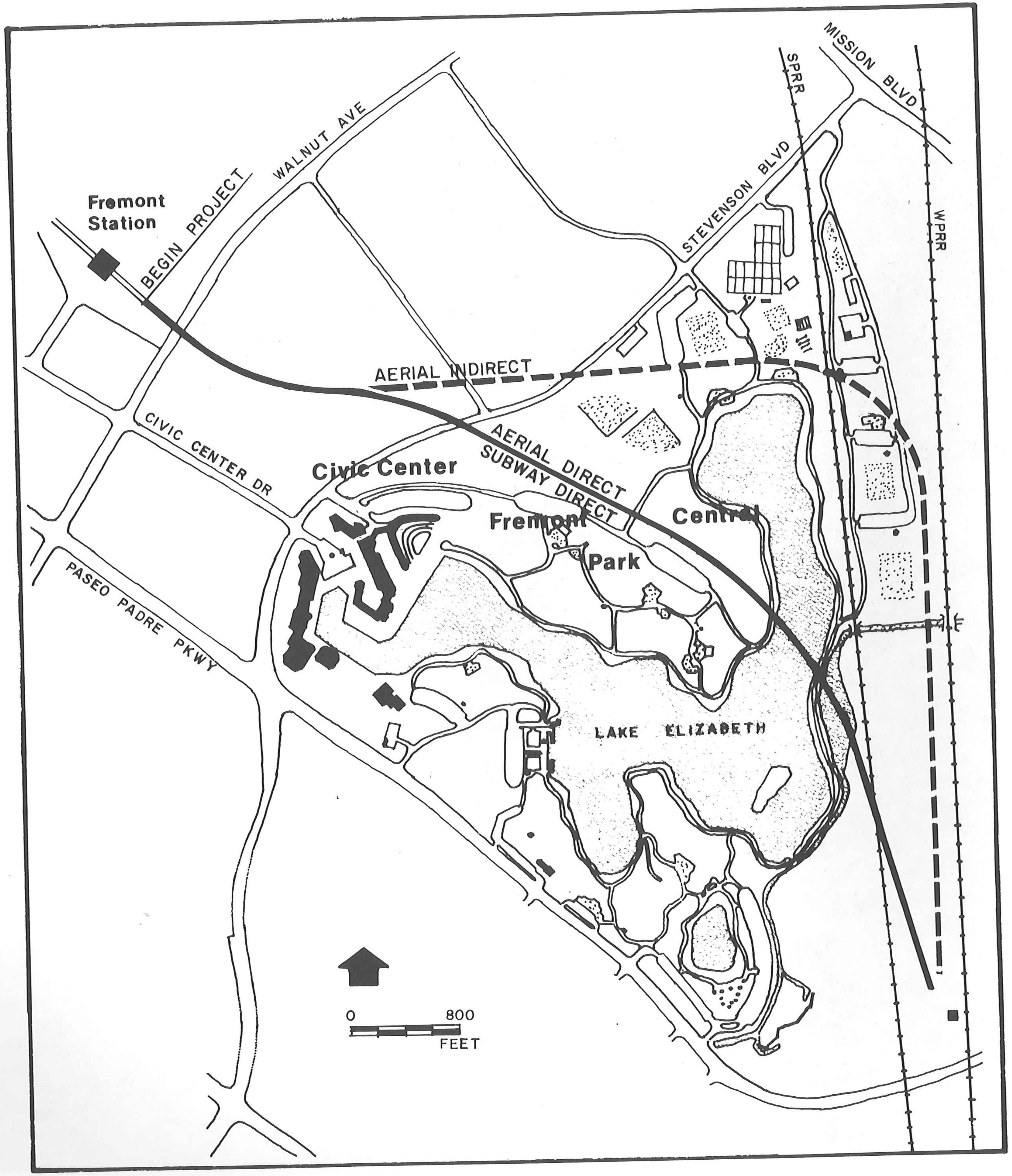
EAST VIEW OF LAKE ELIZABETH, FREMONT CENTRAL PARK AND SURROUNDING RESIDENTIAL AREAS.

PARK SEGMENT ALTERNATIVE: SUBWAY DIRECT

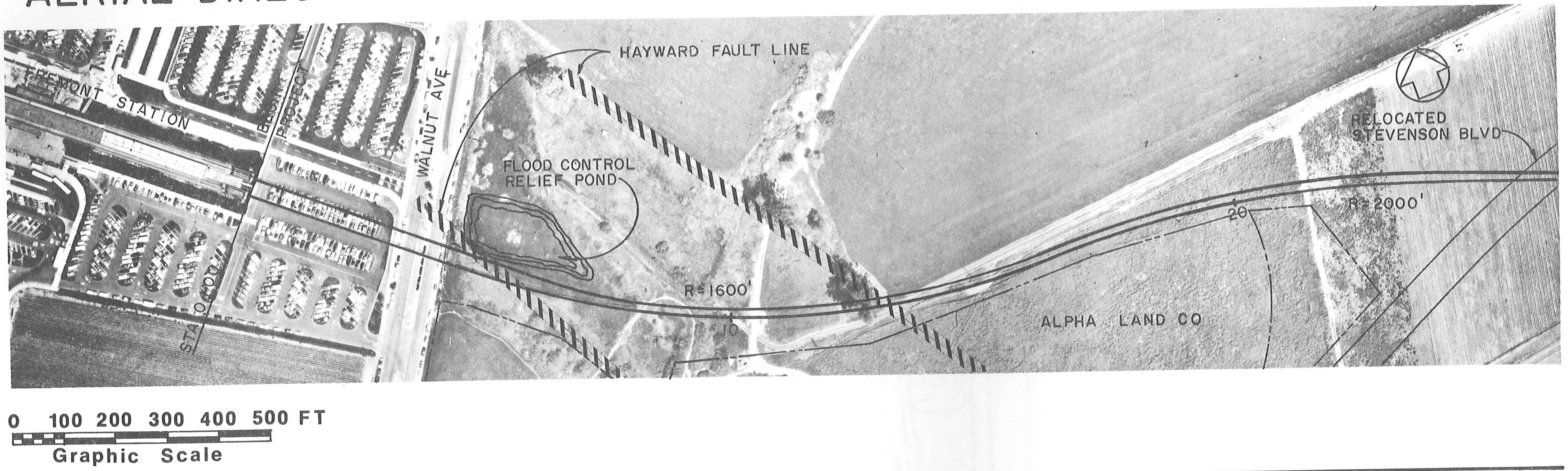
This alignment was developed as a least impact approach to the park environment. This alignment follows an identical horizontal path as described in the aerial direct route. That is to say, all curves and straight sections of track follow the same path as viewed from above. Both routes are 8,600-feet in length. The difference here is the vertical component or track elevation. Maximum allowable train speeds are the same for this alignment as specified under the aerial direct route.

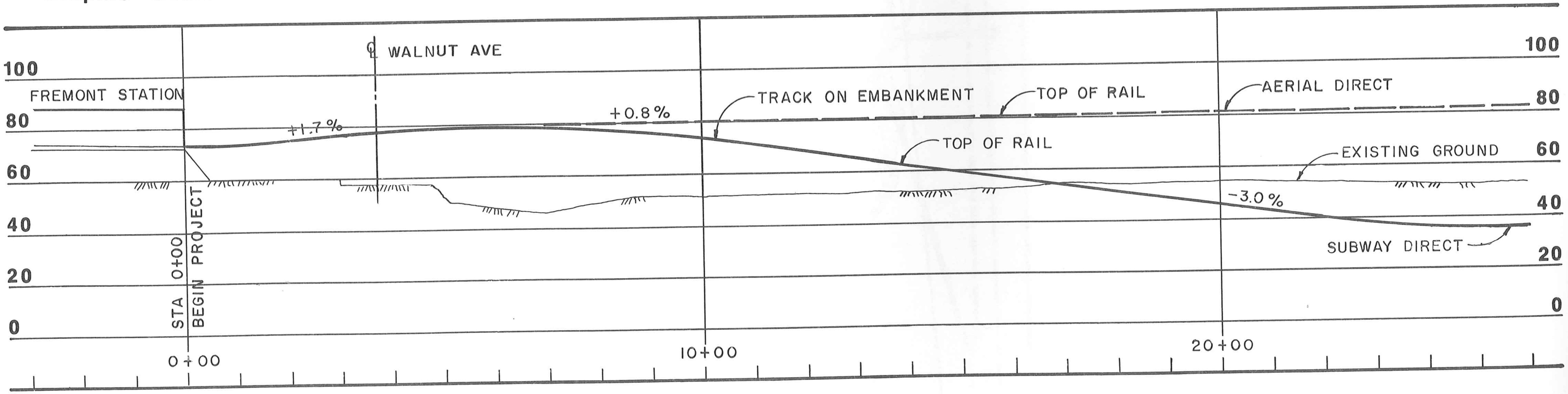
After clearing Walnut Avenue in aerial structure, the alignment descends at a 3% grade to a cut and cover subway structure. The route then passes under Stevenson Boulevard and continues under Lake Elizabeth with 20 feet between the top of the rail and the lake bed. At this point, the alignment ascends at a rate of 4% arriving at grade just prior to crossing the San Francisco Water Department Hetch Hetchy aqueducts 250-feet west of the consolidated SP/WP mainline.

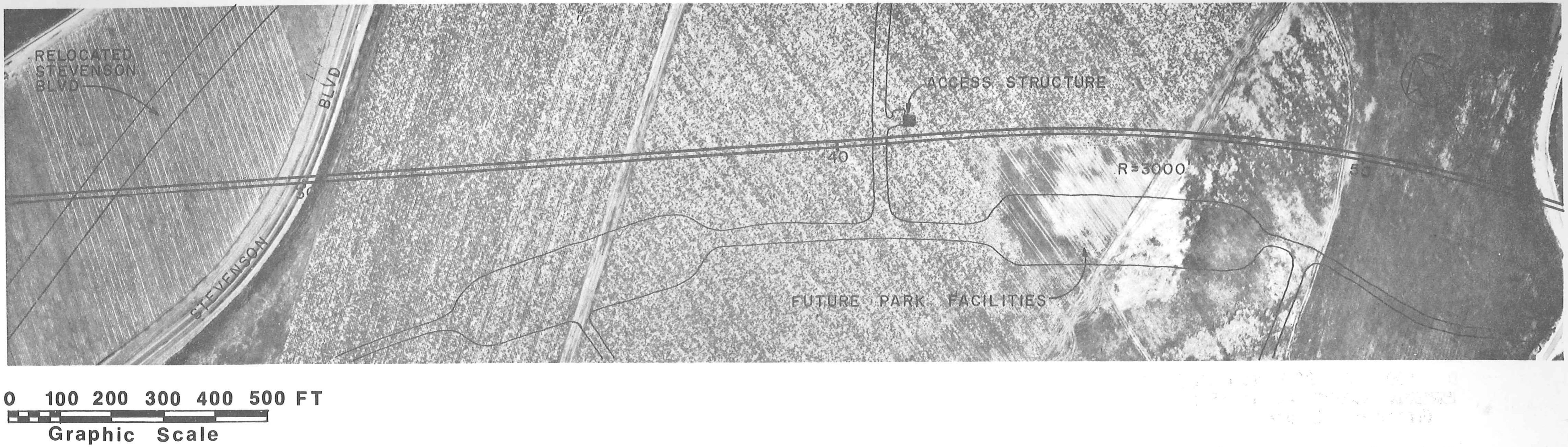
PROPOSED ALTERNATIVE ROUTES SHOWN ON MASTER PLAN FOR FREMONT CENTRAL PARK

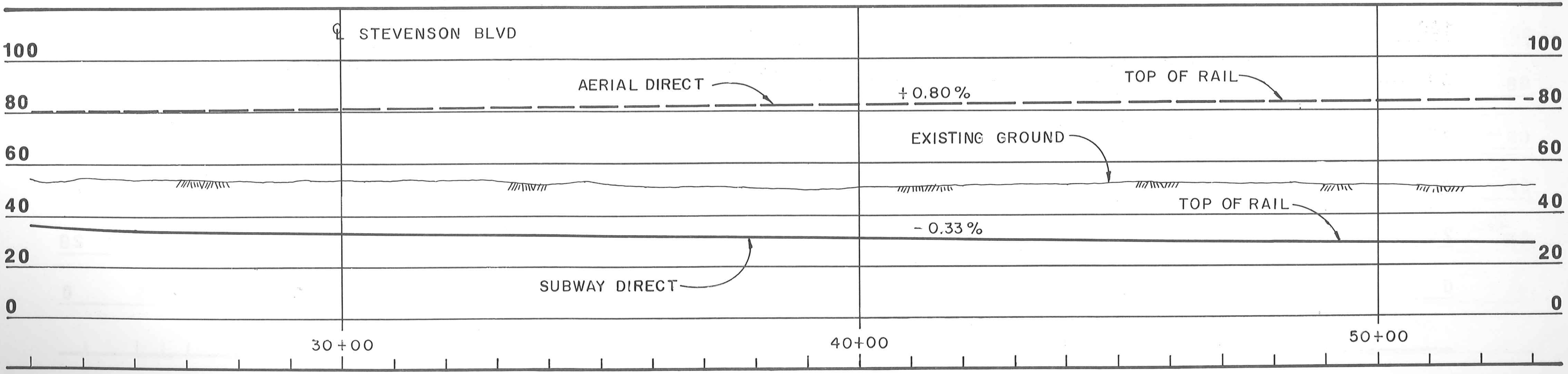


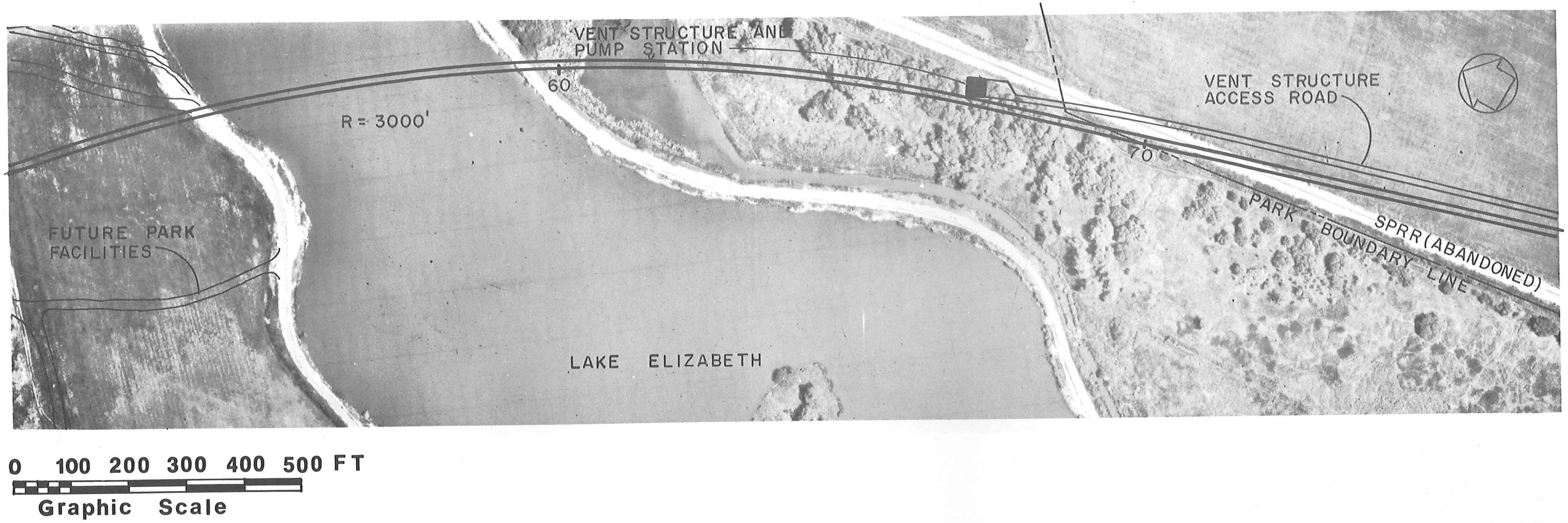
AERIAL DIRECT AND SUBWAY ROUTES THROUGH FREMONT CENTRAL PARK

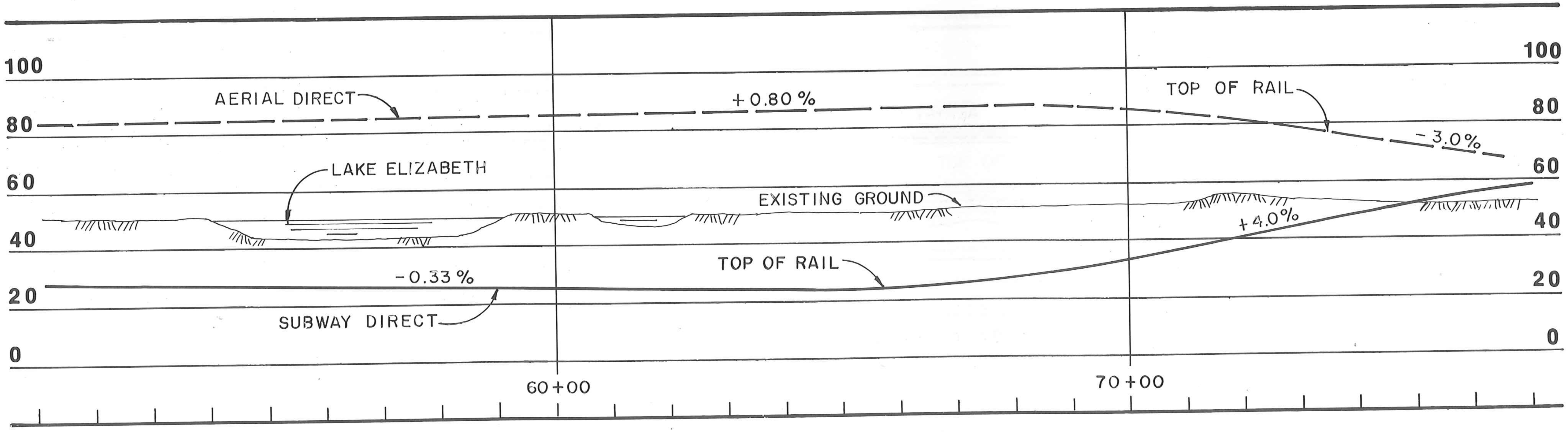




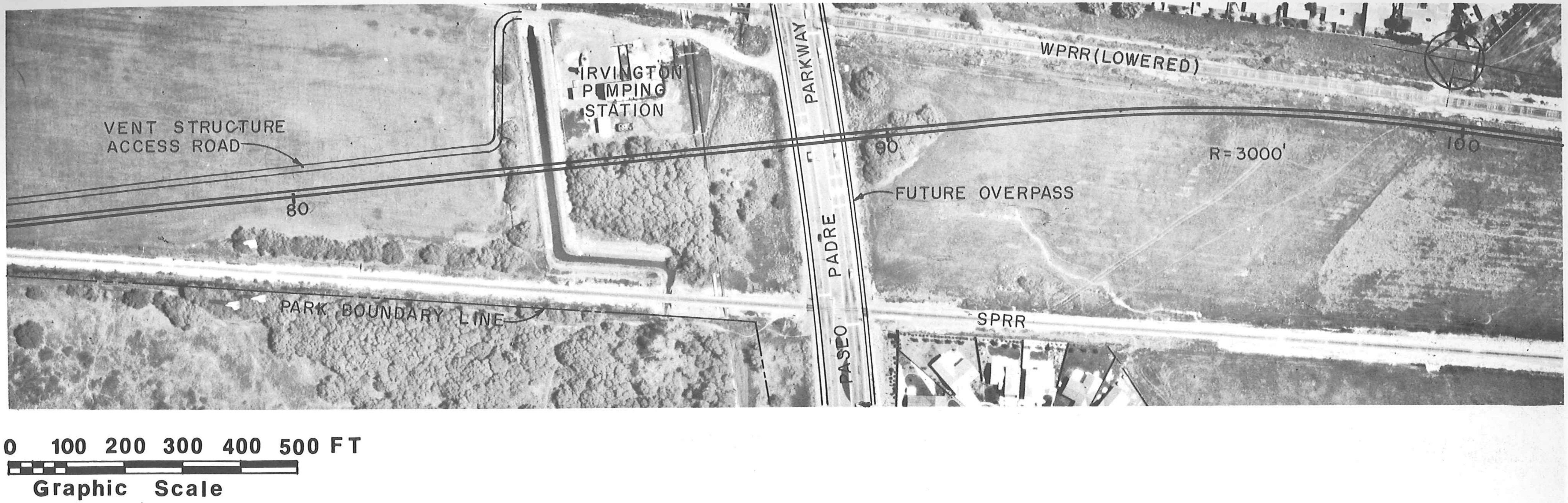

RELOCATED STEVENSON BLVD
BLVD
STEVENSON
30
40
ACCESS STRUCTURE
R=3000
50
FUTURE PARK FACILITIES
0 100 200 300 400 500 FT
Graphic Scale

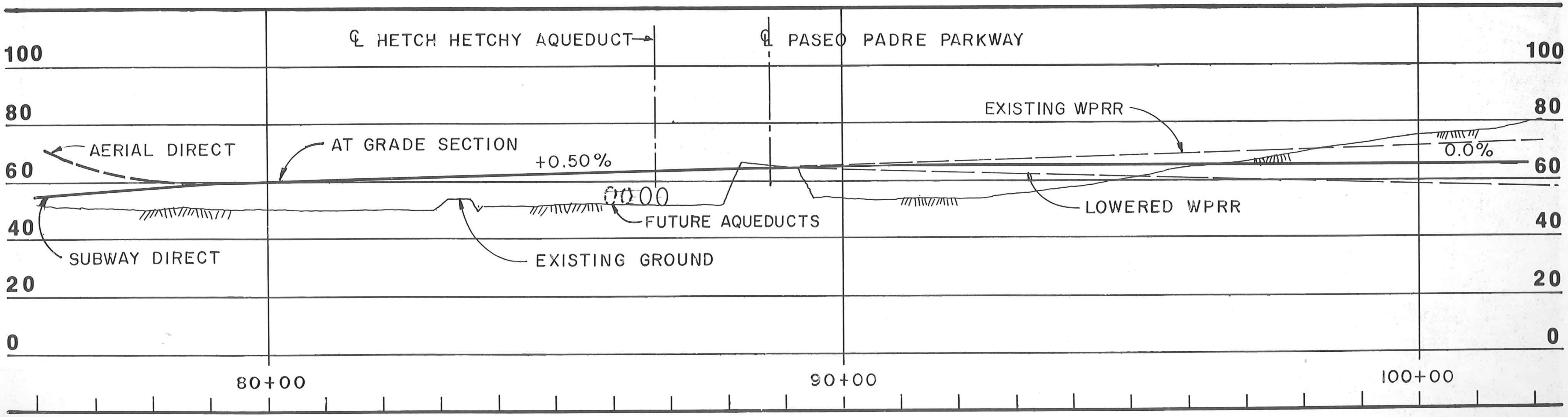

℄ STEVENSON BLVD
100
80
60
40
20
0
AERIAL DIRECT
+0.80%
TOP OF RAIL
EXISTING GROUND
TOP OF RAIL
-0.33%
SUBWAY DIRECT
30+00
40+00
50+00

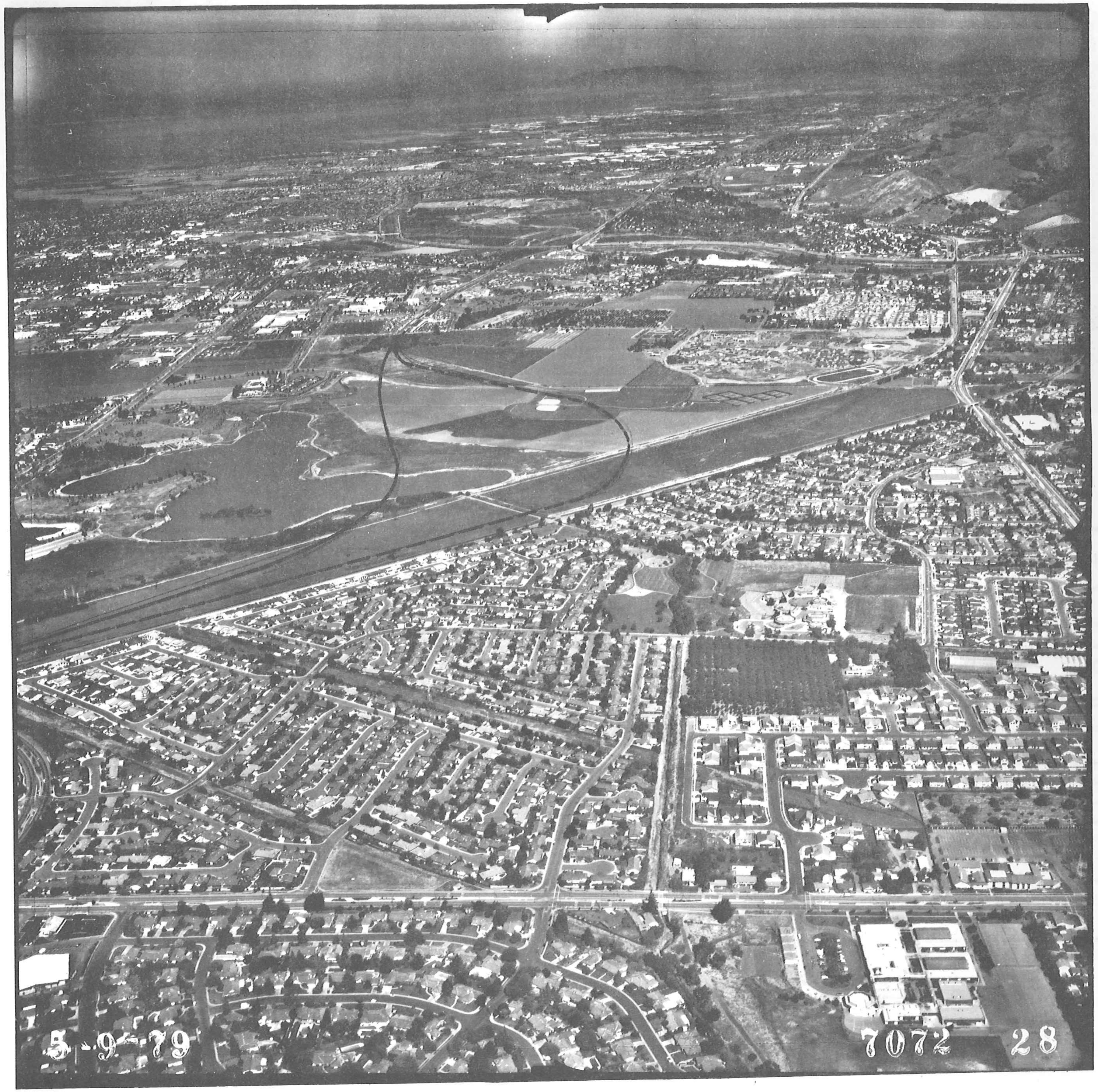

VENT STRUCTURE AND
PUMP STATION
60
R = 3000'
VENT STRUCTURE
ACCESS ROAD
70
PARK BOUNDARY LINE
SPRR (ABANDONED)
FUTURE PARK
FACILITIES
LAKE ELIZABETH
0 100 200 300 400 500 FT
Graphic Scale


100
80
60
40
20
0
AERIAL DIRECT
+0.80 %
TOP OF RAIL
-3.0%
LAKE ELIZABETH
EXISTING GROUND
+4.0%
TOP OF RAIL
-0.33 %
SUBWAY DIRECT
60+00
70+00

AERIAL INDIRECT ROUTE THROUGH FREMONT CENTRAL PARK





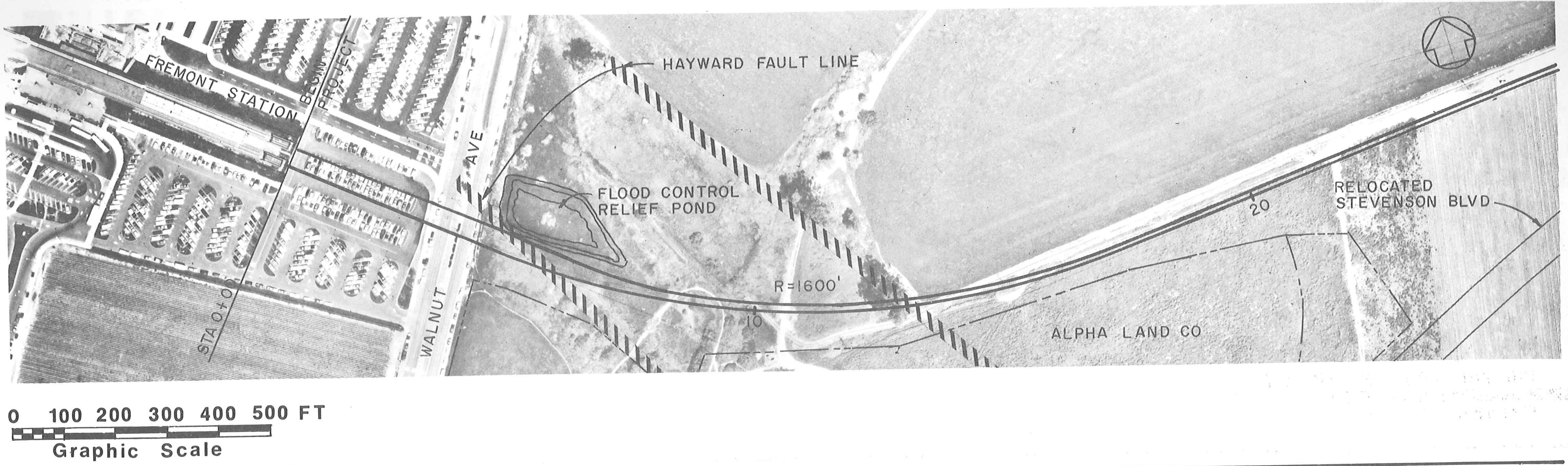


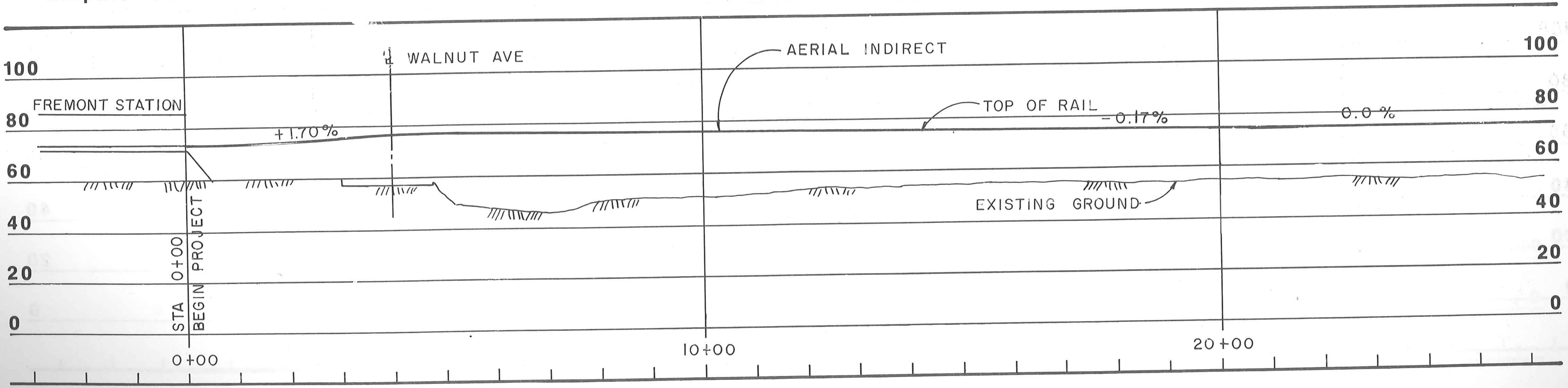
NORTHEAST VIEW OF FREMONT CENTRAL PARK, LAKE ELIZABETH AND SURROUNDING AREAS.

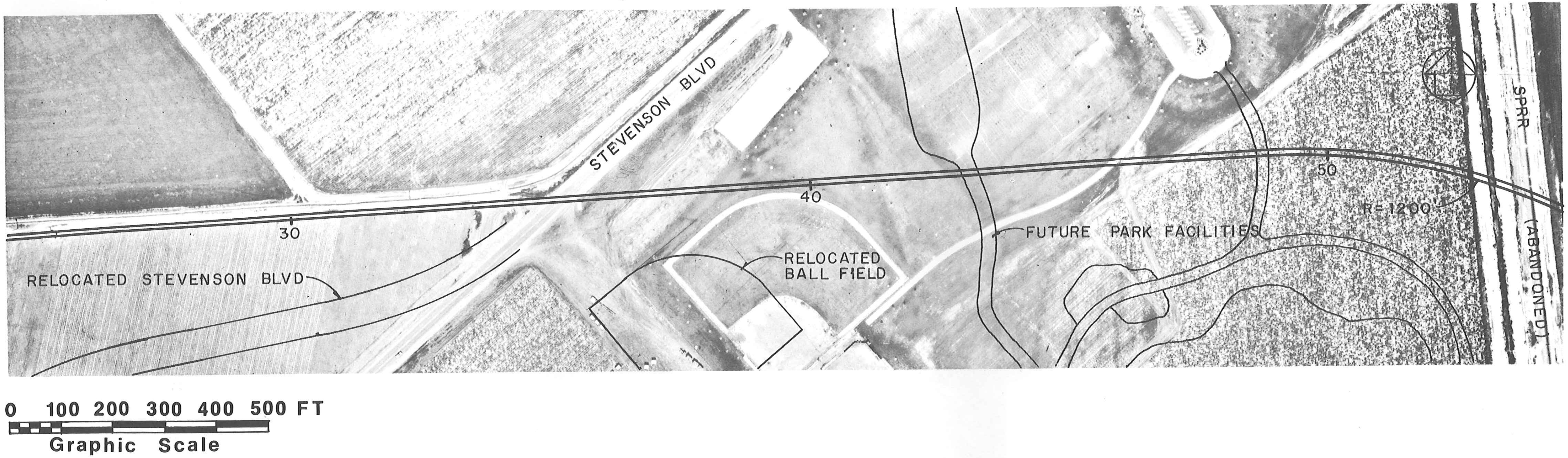
PARK SEGMENT ALTERNATIVE: AERIAL INDIRECT

This alignment was developed as a lower-cost approach relative to the subway route while also attempting to minimize any adverse impacts to the park which may result with an above-grade BART operation. The alignment begins at the Fremont station in embankment with a transition to aerial structure prior to crossing Stevenson Boulevard. After crossing over Walnut Avenue, the line curves to the east traversing the Hayward Fault in embankment then makes a transition to aerial following along the boundary between the Alpha Land Development Corporation and school district property (formerly designated for the SR-238 freeway). The aerial line continues in a straight easterly path crossing Stevenson Boulevard and over the northeast corner of the park. At a point approximately 400-feet west of the abandoned SP mainline, the BART aerial structure negotiates a 1,200-foot radius curve swinging south and gradually descending to grade at a point immediately west of the San Francisco Water Department pumping facility. The speed profile for this 10,400-foot segment is restricted to 36-miles per hour within 1,600-feet of the Fremont station and 50 miles per hour for the 1,200-foot radius curve within the park. Maximum 80 mile per hour operation is allowable on remaining straight sections of track for this segment. Compared to the first two park alternatives, it is estimated that trains will require an additional 45 seconds to travel between the Fremont station and Paseo Padre Parkway.

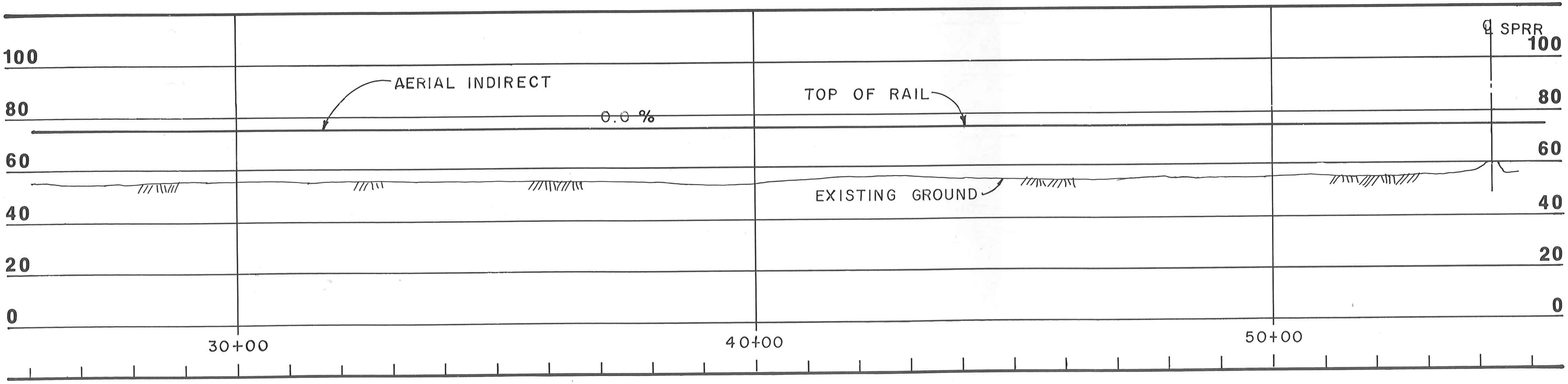
AERIAL INDIRECT ROUTE THROUGH FREMONT CENTRAL PARK



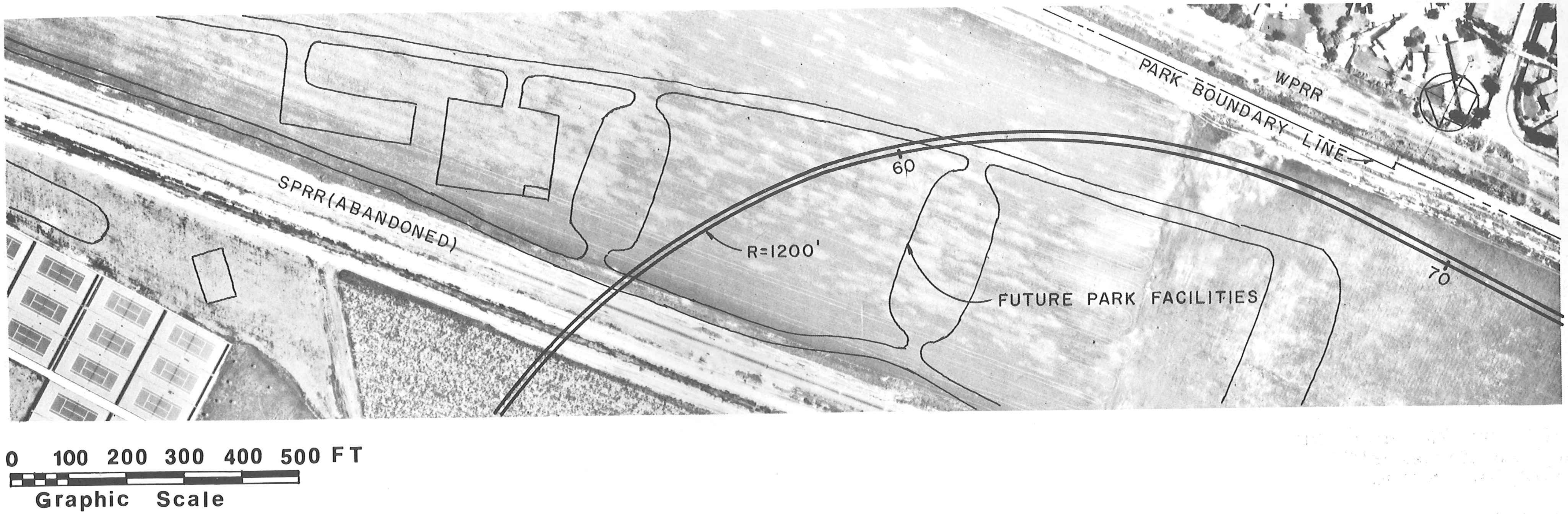


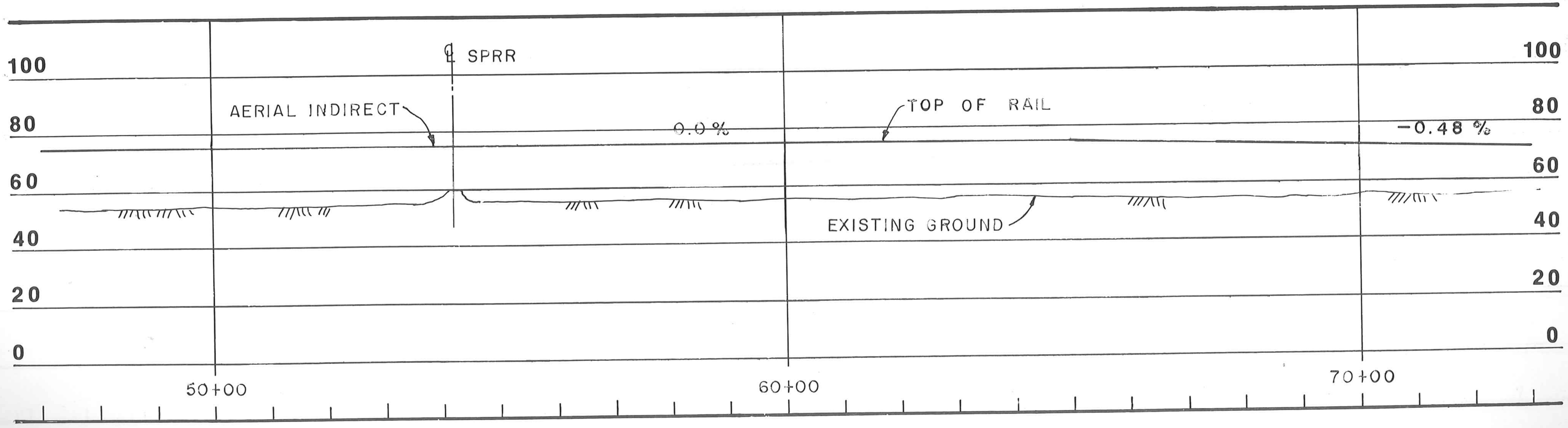


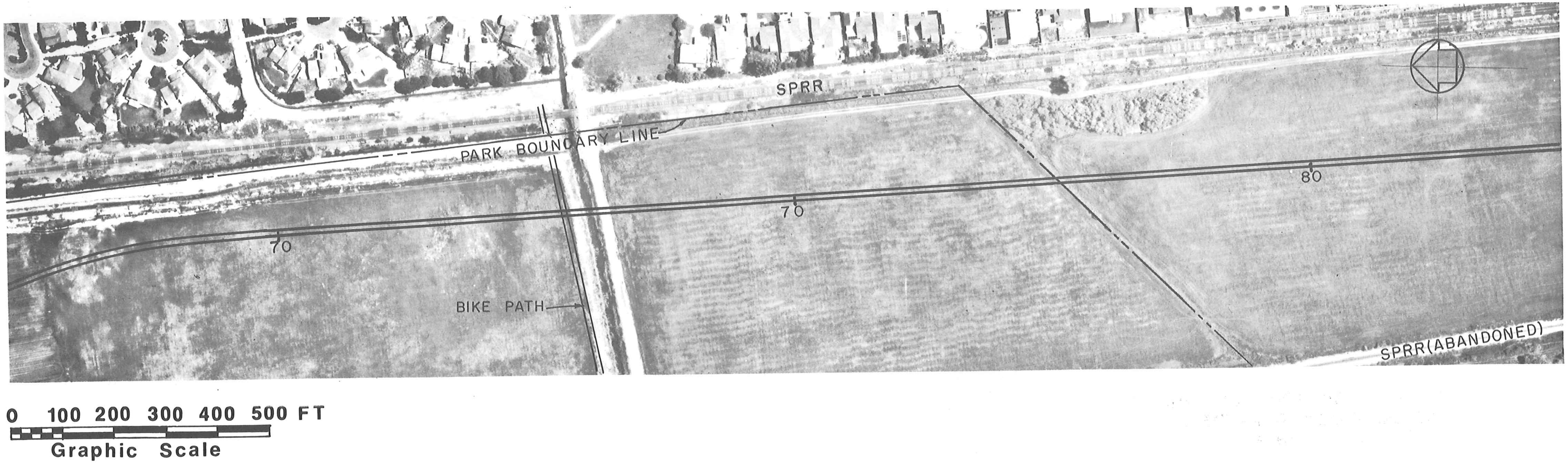
STEVENSON BLVD
30
40
50
RELOCATED STEVENSON BLVD
RELOCATED BALL FIELD
FUTURE PARK FACILITIES
R=1200'
SPRR
(ABANDONED)
0 100 200 300 400 500 FT
Graphic Scale

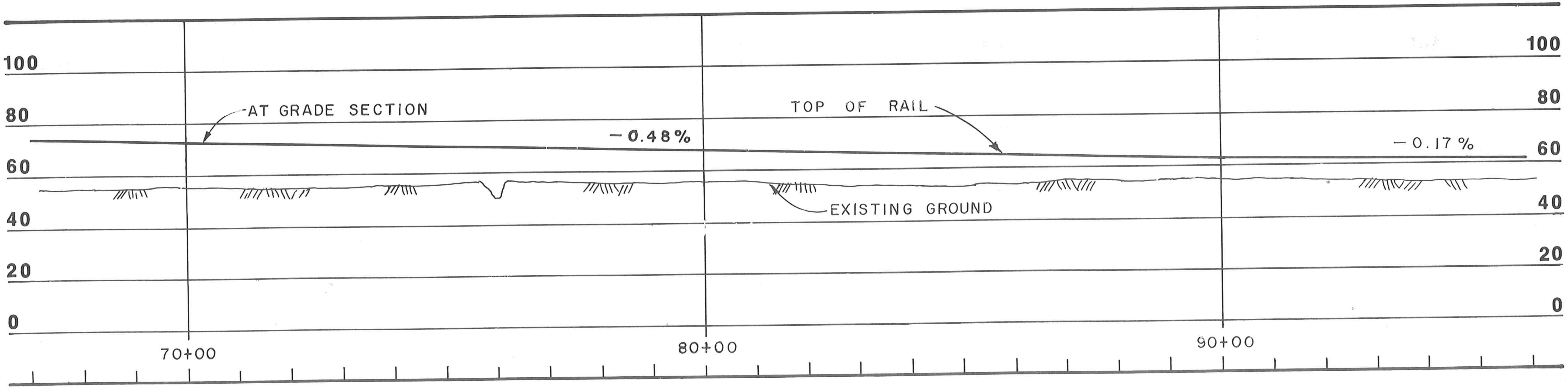


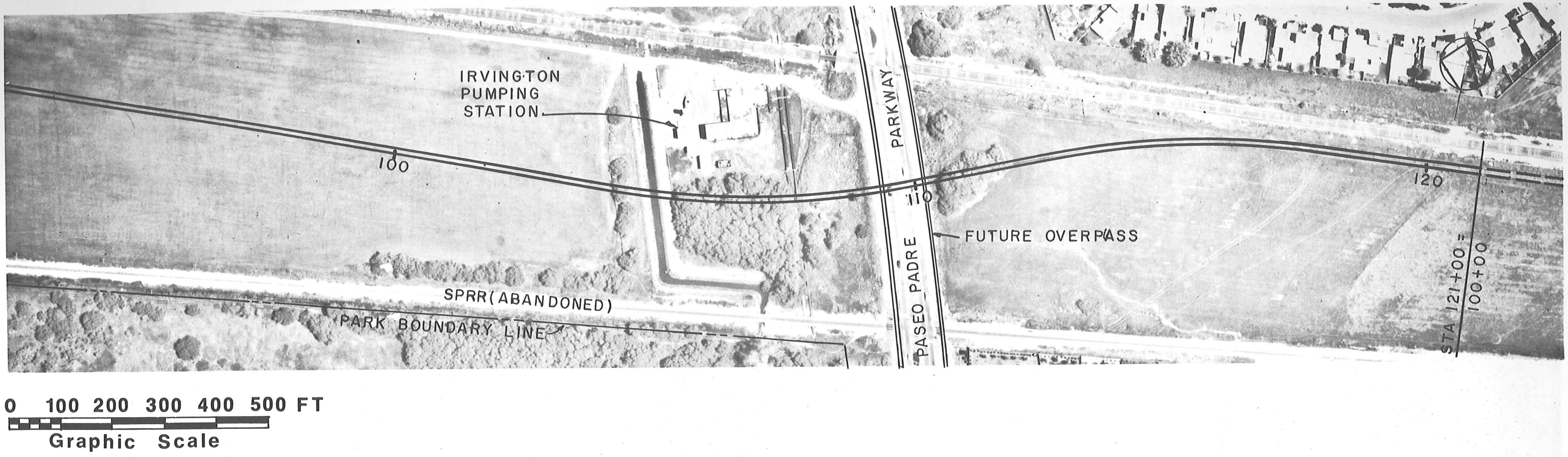
℄ SPRR
100
80
60
40
20
0
AERIAL INDIRECT
0.0 %
TOP OF RAIL
EXISTING GROUND
30+00
40+00
50+00

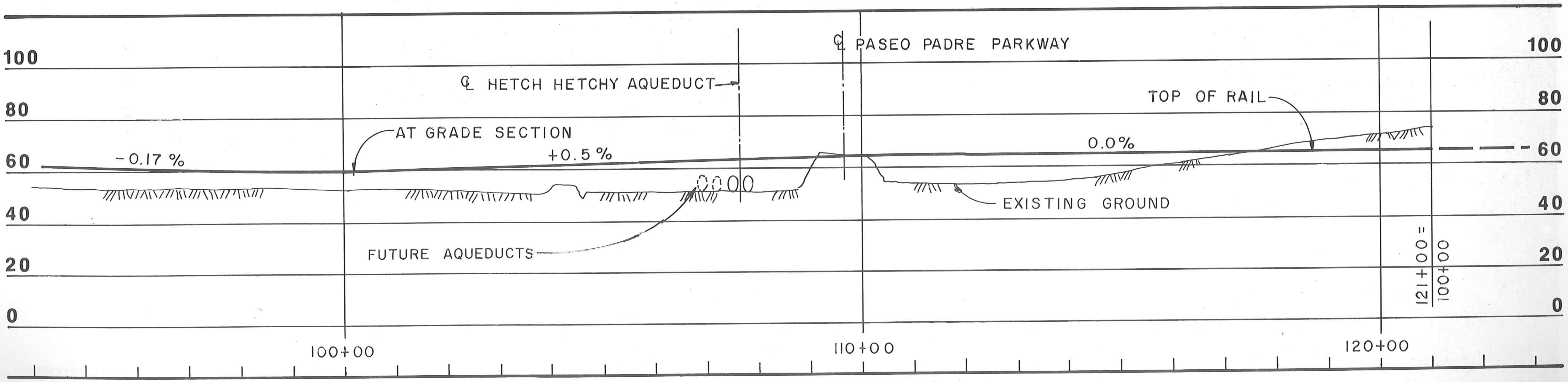

PARK BOUNDARY LINE
WPRR
SPRR(ABANDONED)
60
R=1200'
FUTURE PARK FACILITIES
70
0 100 200 300 400 500 FT
Graphic Scale

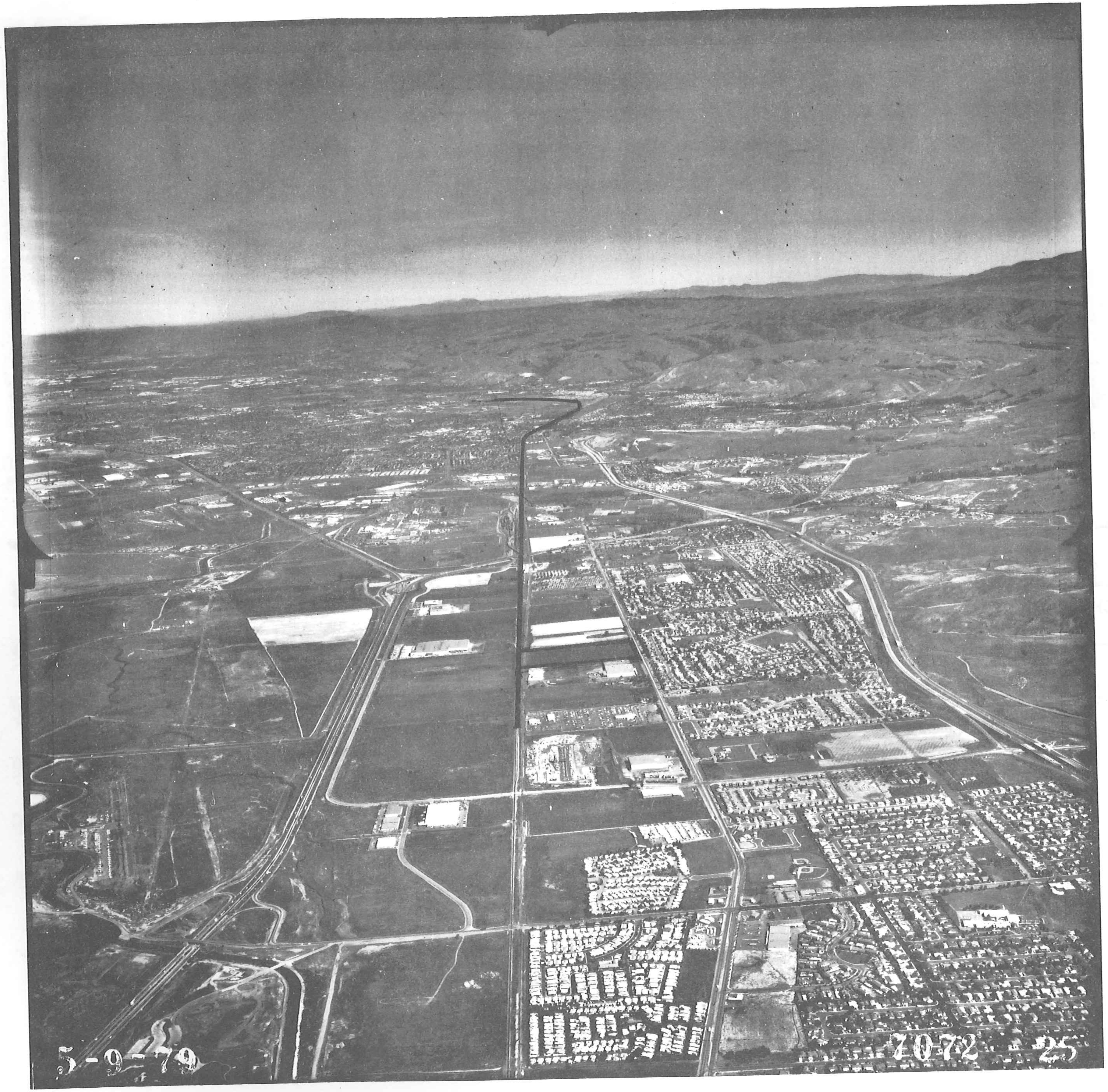

℄ SPRR
AERIAL INDIRECT
0.0 %
TOP OF RAIL
-0.48 %
EXISTING GROUND
100
80
60
40
20
0
50+00
60+00
70+00


SPRR
PARK BOUNDARY LINE
80
70
70
BIKE PATH
SPRR(ABANDONED)
0 100 200 300 400 500 FT
Graphic Scale


100
80
60
40
20
0
100
80
60
40
20
0
AT GRADE SECTION
TOP OF RAIL
−0.48%
−0.17 %
EXISTING GROUND
70+00
80+00
90+00


IRVINGTON PUMPING STATION
PARKWAY
PASEO PADRE
100
110
120
FUTURE OVERPASS
STA 121+00 = 100+00
SPRR (ABANDONED)
PARK BOUNDARY LINE
0 100 200 300 400 500 FT
Graphic Scale


℄ PASEO PADRE PARKWAY
℄ HETCH HETCHY AQUEDUCT
TOP OF RAIL
AT GRADE SECTION
-0.17 %
+0.5 %
0.0%
EXISTING GROUND
FUTURE AQUEDUCTS
121+00 = 100+00
100
80
60
40
20
0
100+00
110+00
120+00

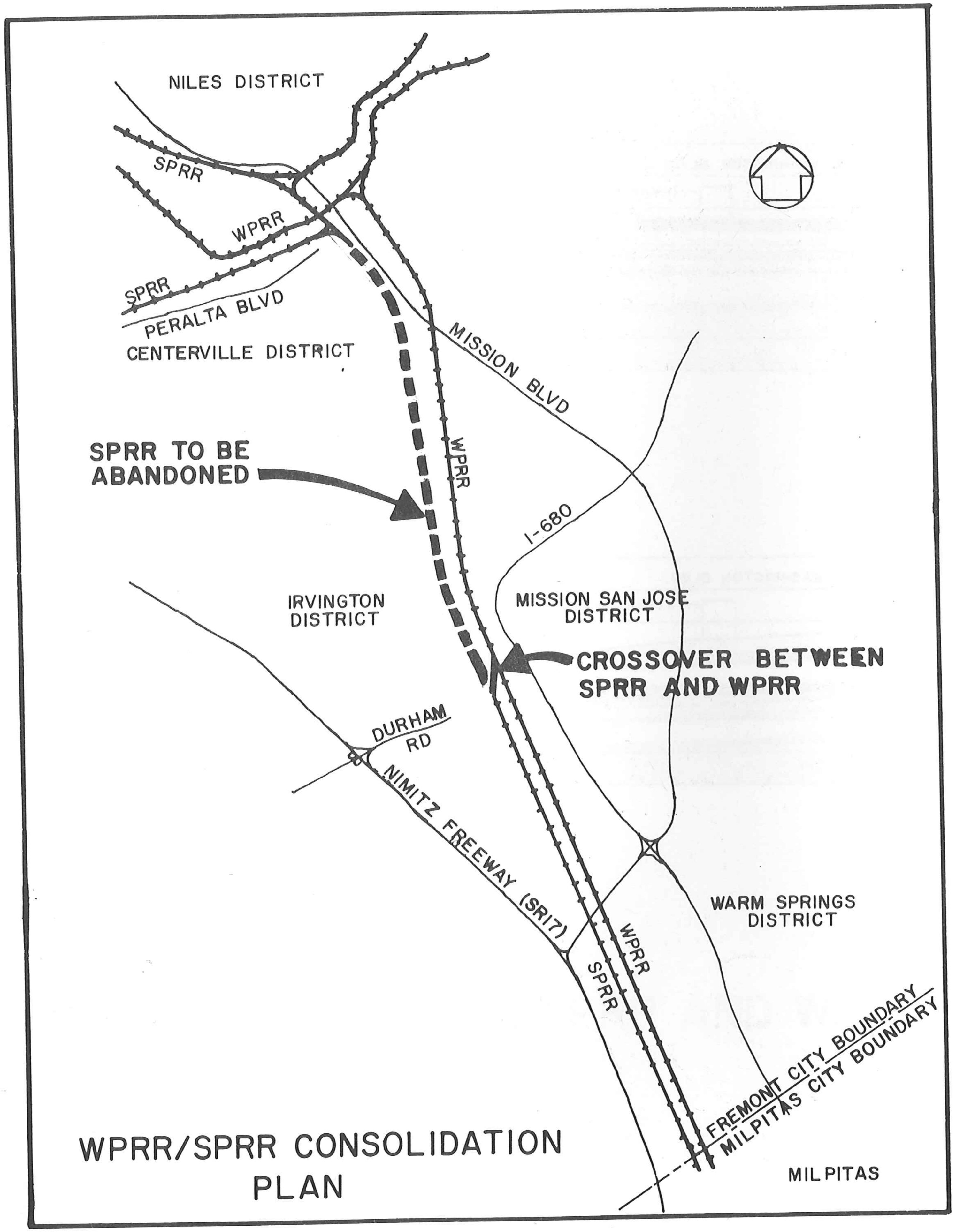


SOUTHERN PORTION OF THE CORRIDOR LOOKING TO THE NORTH. SCOTT CREEK STATION SITE IS IN THE LOWER PORTION OF THE PHOTO WITH RESIDENTIAL AREAS IN THE CITY OF MILPITAS IMMEDIATELY TO THE SOUTH.

SOUTHERN SEGMENT: PASEO PADRE BOULEVARD TO SCOTT CREEK ROAD

Two alternative alignments have been identified for this portion of the extension developed in response to the concerns expressed by the City of Fremont and SP and WP in relation to the proposed depressed rail right-of-way. The first alternative consists of a 3,800-foot long depressed rail corridor starting 700-feet south of Paseo Padre Parkway and ending 1,400-feet south of Washington Boulevard; just beyond the Irvington station. This configuration allows for a grade separated Blacow Road underpass to be constructed. Immediately south of the Blacow underpass, BART would need to be depressed again for an additional 3,200-feet to allow for the branching of the consolidated SP/WP line into two mainlines. The BART alignment would then resurface just north of Durham Road in between the SP and WP lines. This is the preferred configuration from the perspective of the WP based on their need to provide adequate maintenance vehicle access to the right-of-way. This has been labeled the minimum depressed right-of-way alternative.

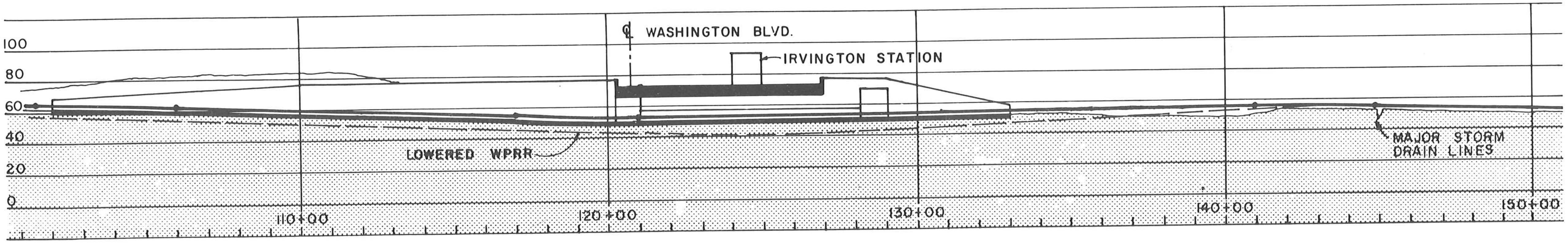
An alternative to the above is to extend the depressed BART-SP/WP rail corridor



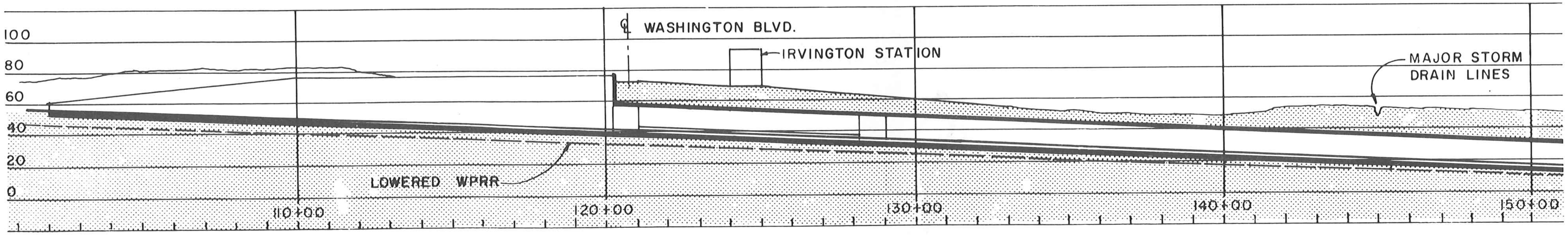
WPRR/SPRR CONSOLIDATION PLAN

further south to a point 1,000-feet north of Durham Road. The total length of this depressed right-of-way is 9,300-feet and would allow for an at-grade crossing of Blacow Road over the rail corridor. This is the preferred configuration from the city's perspective based on visual and nose impacts associated with rail operations. The branching of the SP and WP into two lines is accommodated by maintaining a depressed BART alignment while the SP/WP mainline ascends to grade. The branching occurs via a crossover track located directly above an enclosed BART alignment and supported by the roof of a cement box structure. The BART alignment then ascends to grade in between the two SP and WP tracks.

South of Durham Road, the BART alignment is located between the SP and WP mainlines under both alternatives. The right-of-way requirements for the three railroads will require a 40-feet eastward realignment of the WP track for the segment south of the consolidated mainline branching.

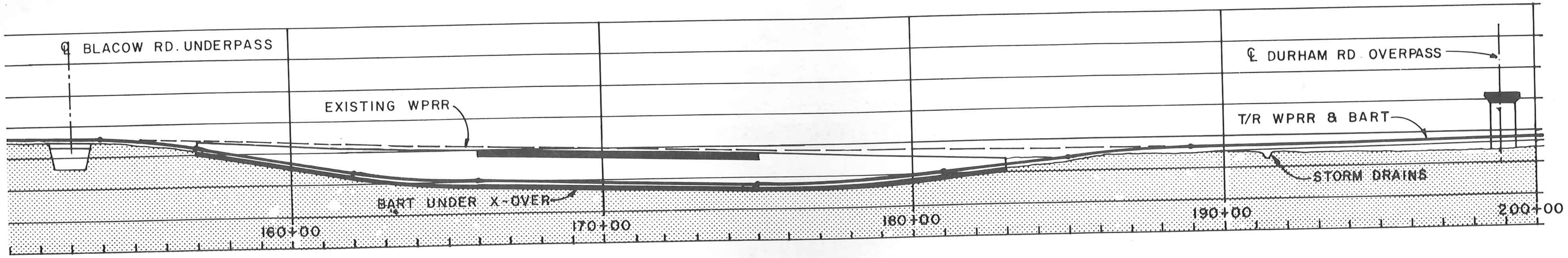


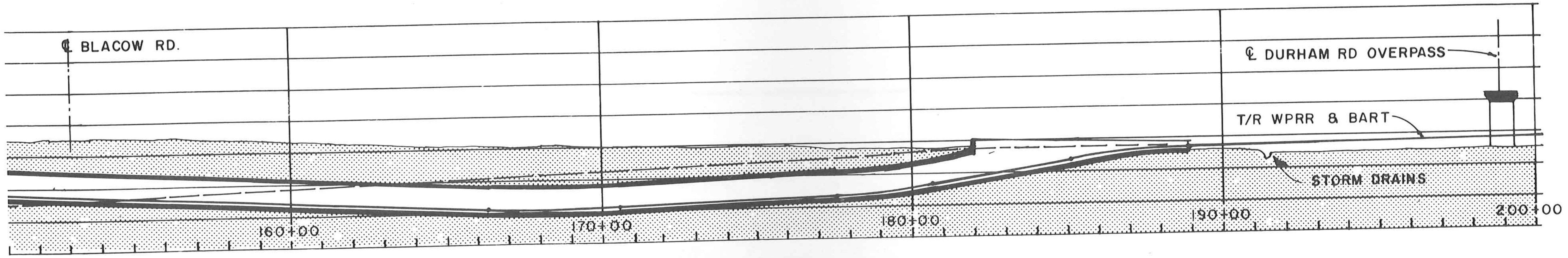
MINIMUM DEPRESSED RAIL CORRIDOR



EXTENDED DEPRESSED RAIL CORRIDOR

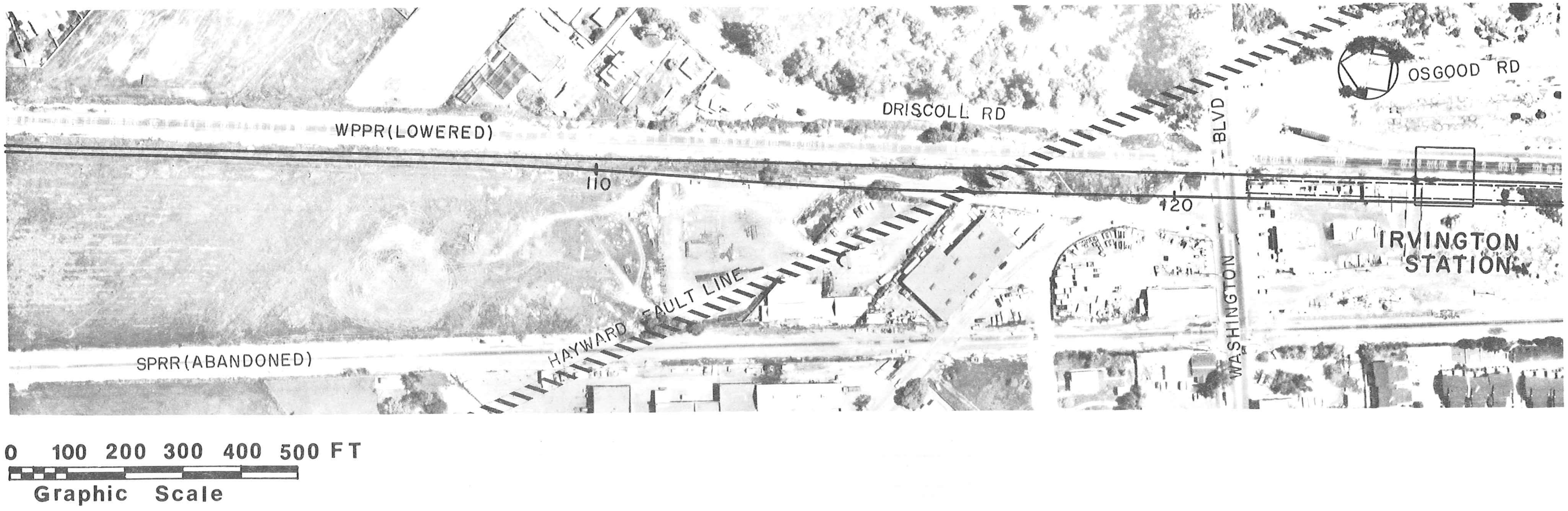
SOUTHERN ALIGNMENT

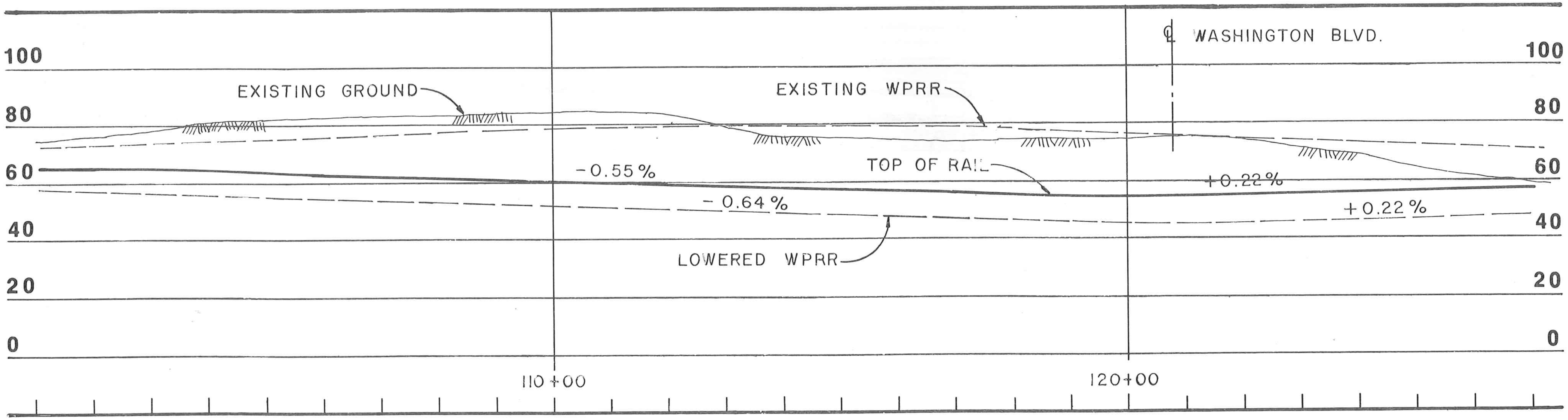


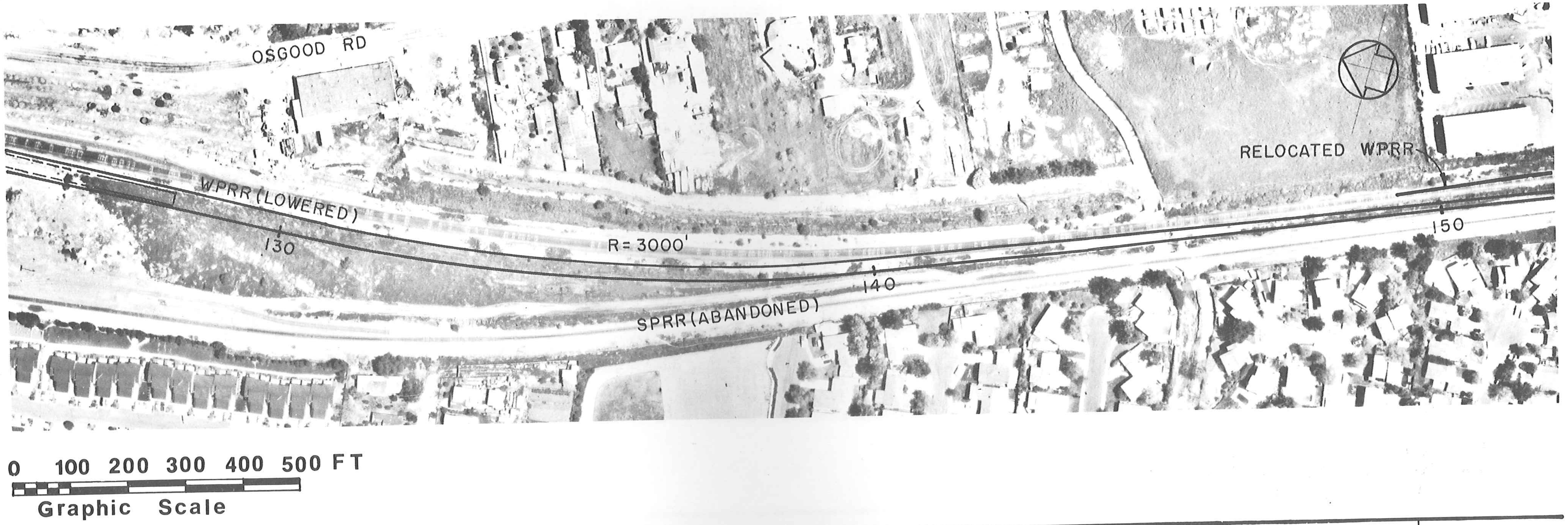


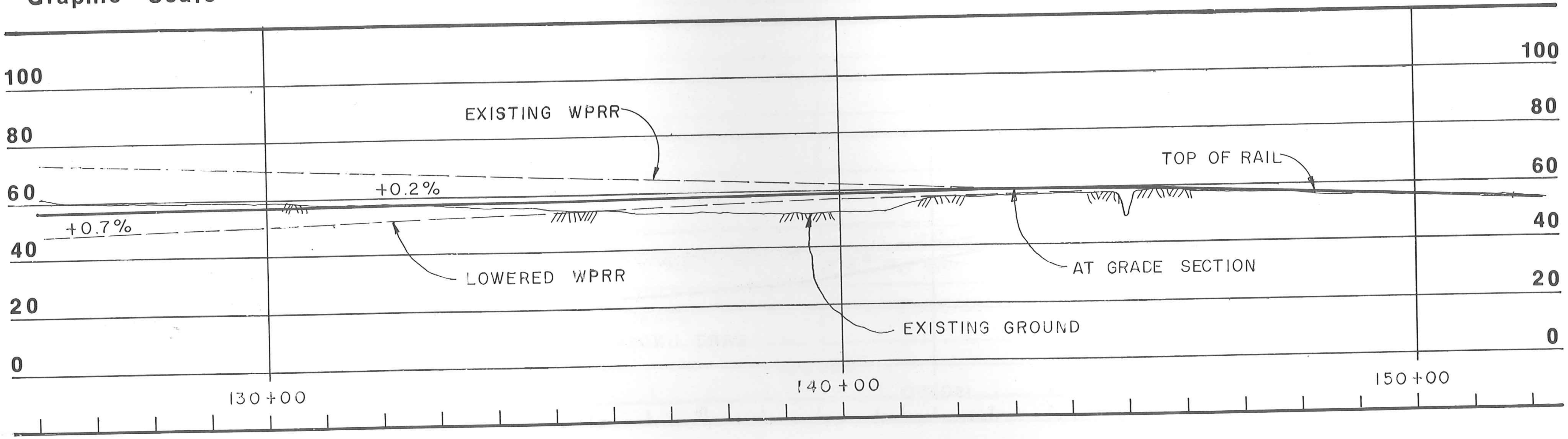
ALTERNATIVES FOR BART, SPRR AND WPRR

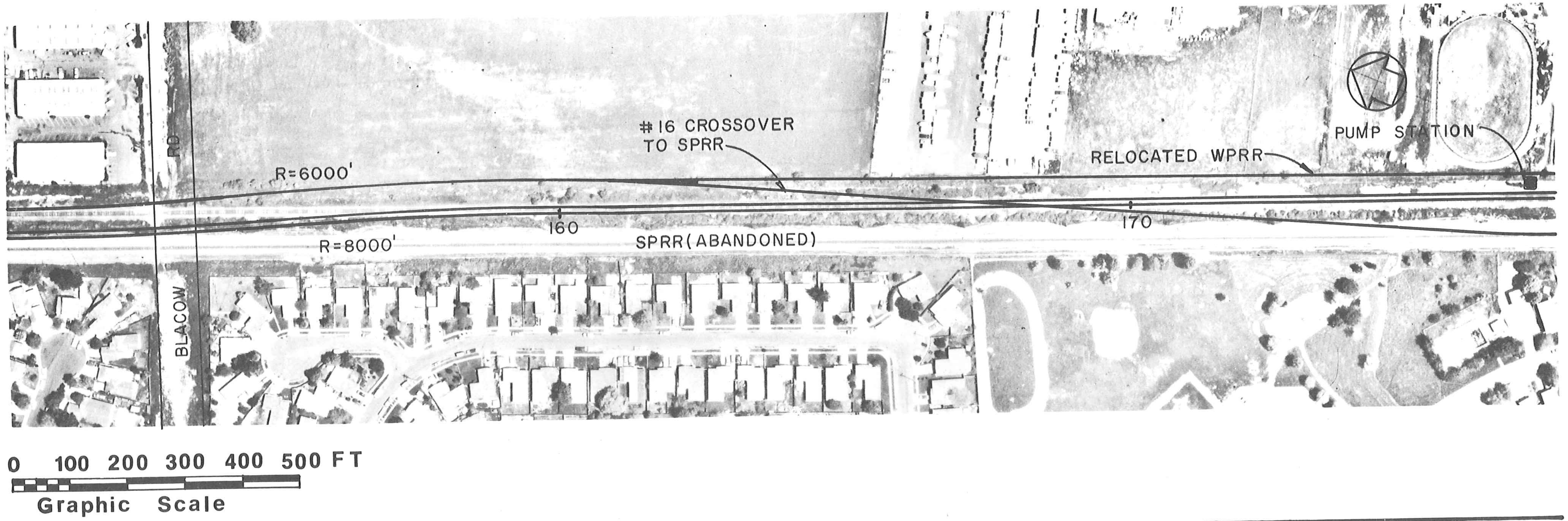
SOUTHERN SEGMENT OF EXTENSION

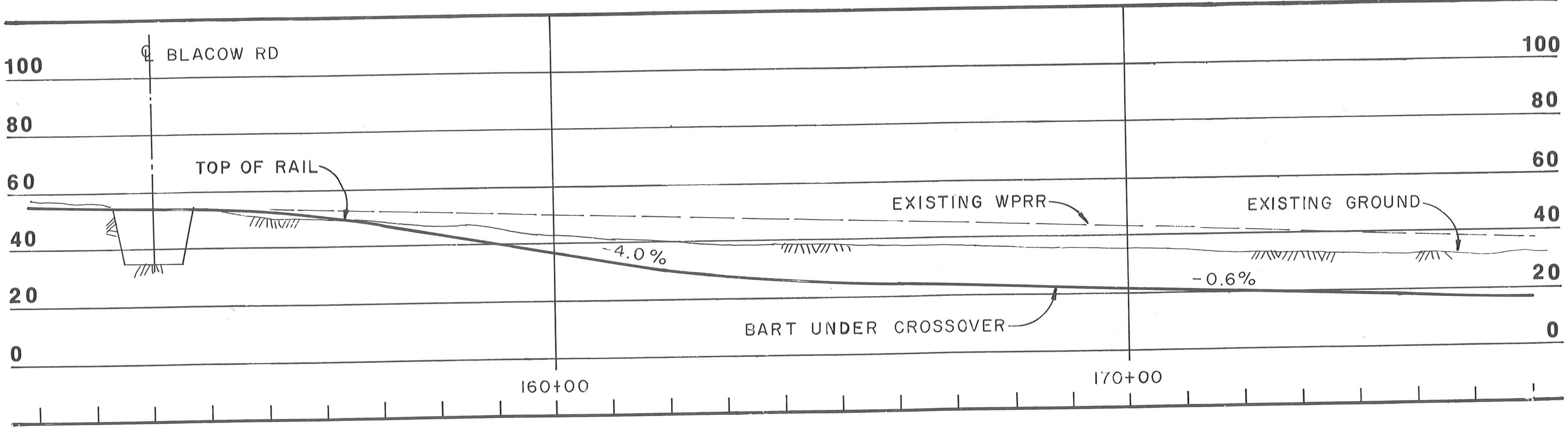


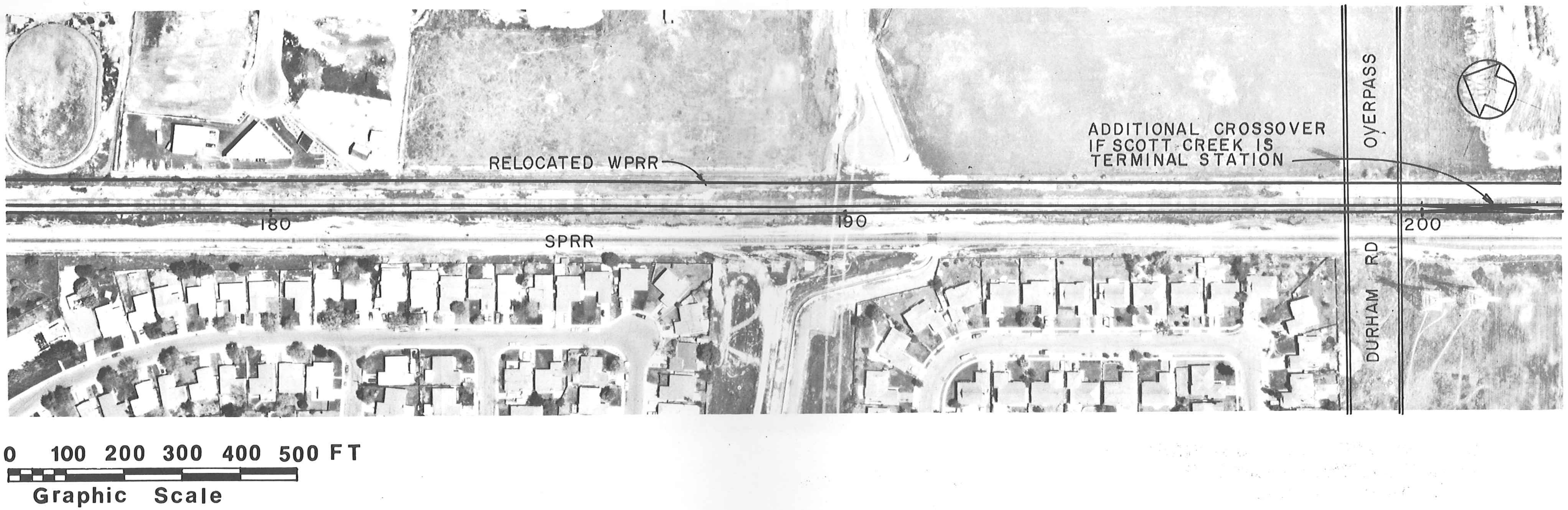


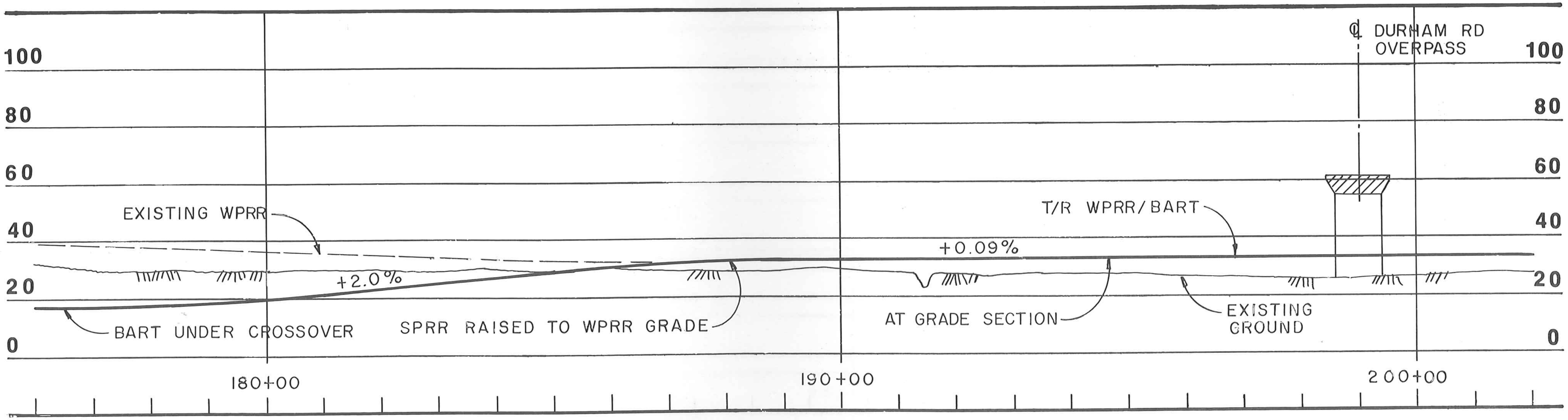

OSGOOD RD
WPRR (LOWERED)
130
R= 3000'
140
SPRR (ABANDONED)
RELOCATED WPRR
150
0 100 200 300 400 500 FT
Graphic Scale

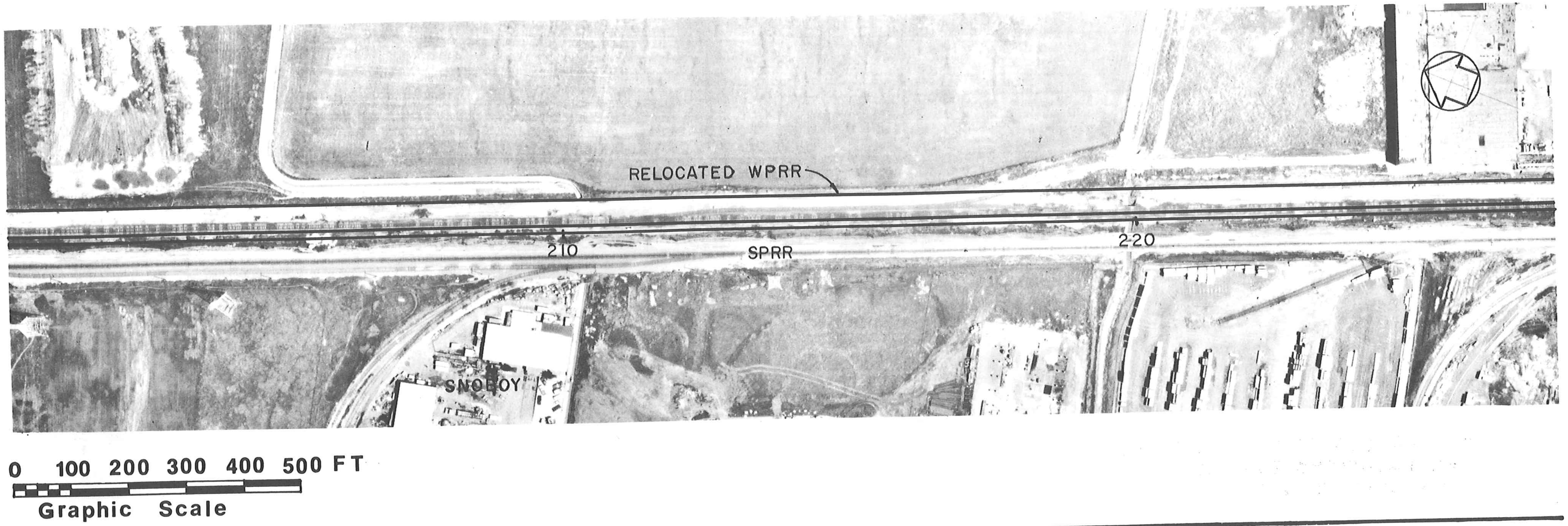

100
80
60
40
20
0
EXISTING WPRR
+0.2%
+0.7%
LOWERED WPRR
EXISTING GROUND
AT GRADE SECTION
TOP OF RAIL
130+00
140+00
150+00

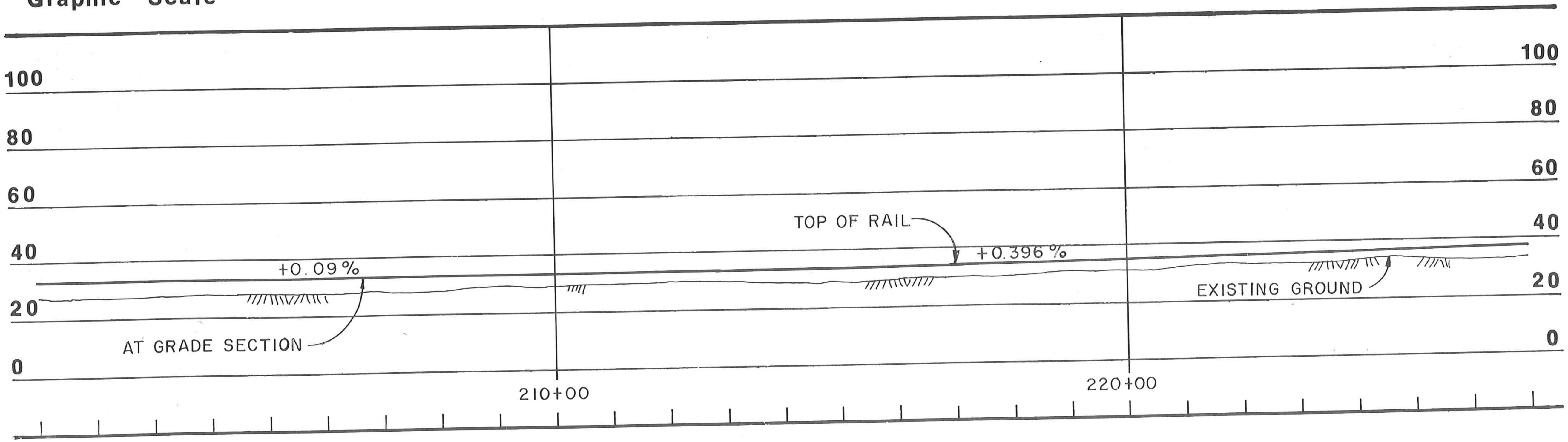

RD
BLACOW
R=6000'
#16 CROSSOVER TO SPRR
RELOCATED WPRR
PUMP STATION
160
170
R=8000'
SPRR(ABANDONED)
0 100 200 300 400 500 FT
Graphic Scale

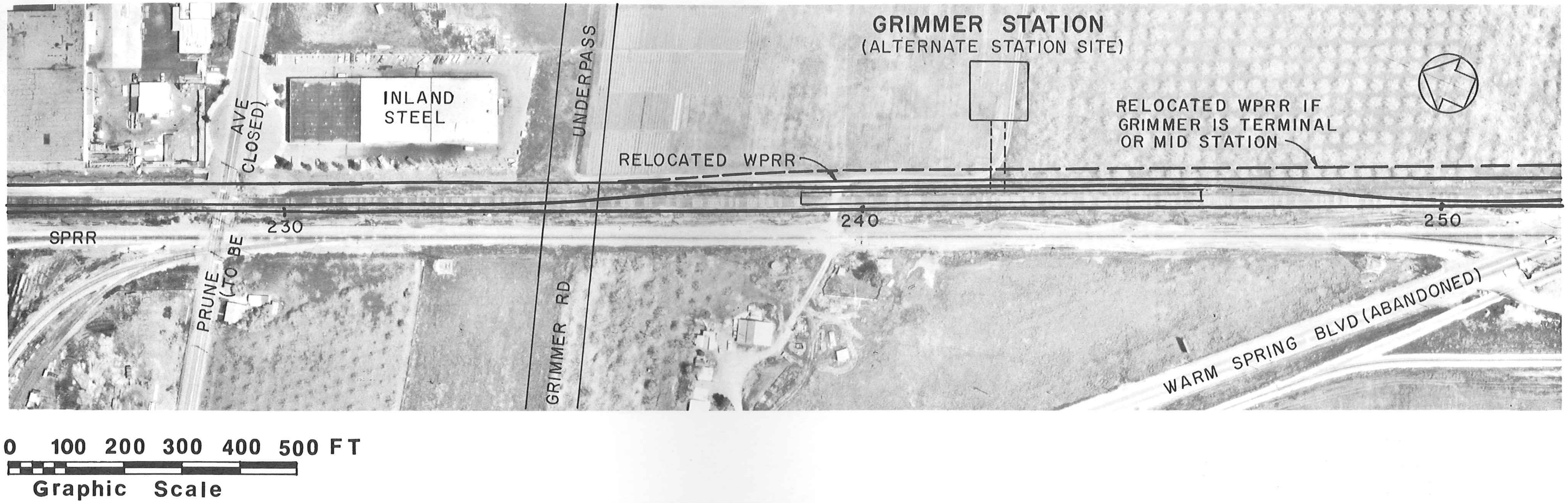

℄ BLACOW RD
100
80
60
40
20
0
TOP OF RAIL
EXISTING WPRR
EXISTING GROUND
-4.0%
-0.6%
BART UNDER CROSSOVER
160+00
170+00
100
80
60
40
20
0

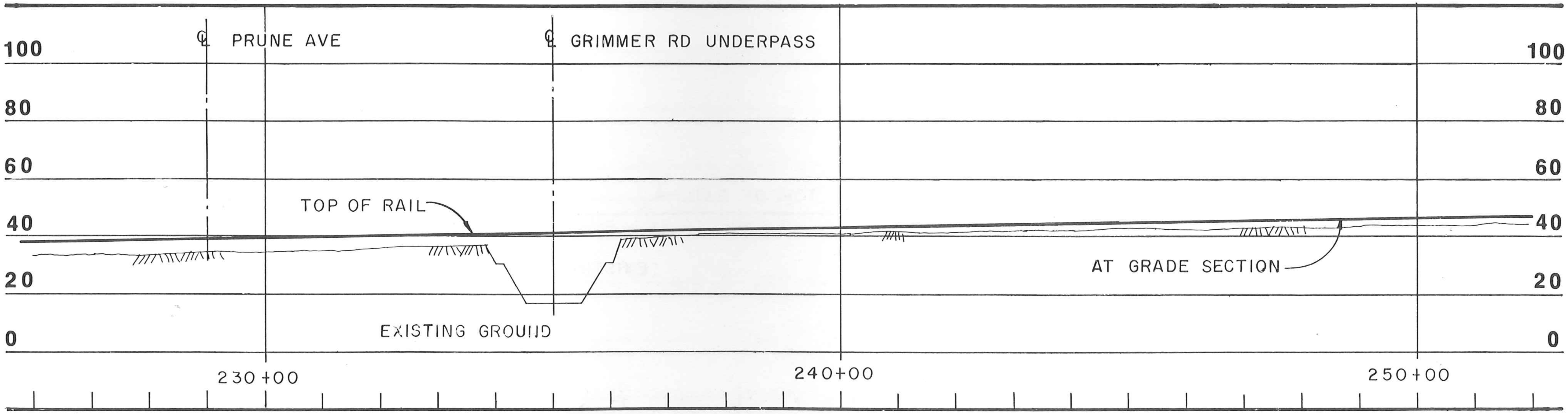

RELOCATED WPRR
ADDITIONAL CROSSOVER IF SCOTT CREEK IS TERMINAL STATION
OVERPASS
180
190
200
SPRR
DURHAM RD
0 100 200 300 400 500 FT
Graphic Scale

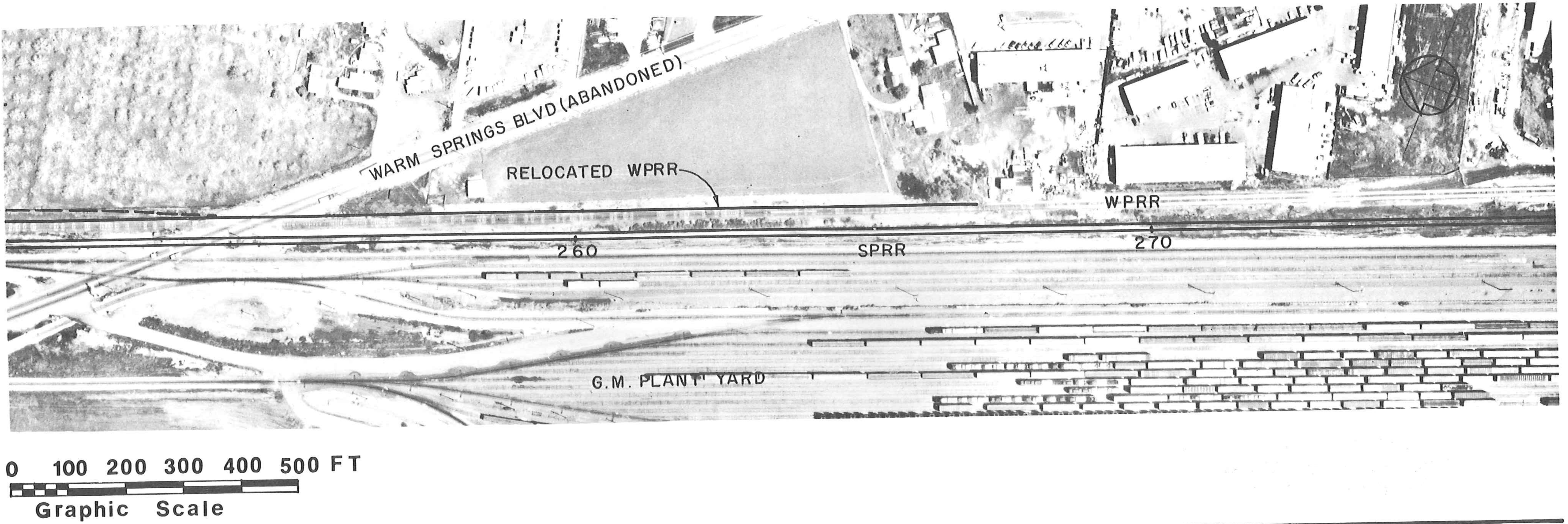

℄ DURHAM RD OVERPASS
100
80
60
40
20
0
EXISTING WPRR
T/R WPRR/BART
+0.09%
+2.0%
BART UNDER CROSSOVER
SPRR RAISED TO WPRR GRADE
AT GRADE SECTION
EXISTING GROUND
180+00
190+00
200+00

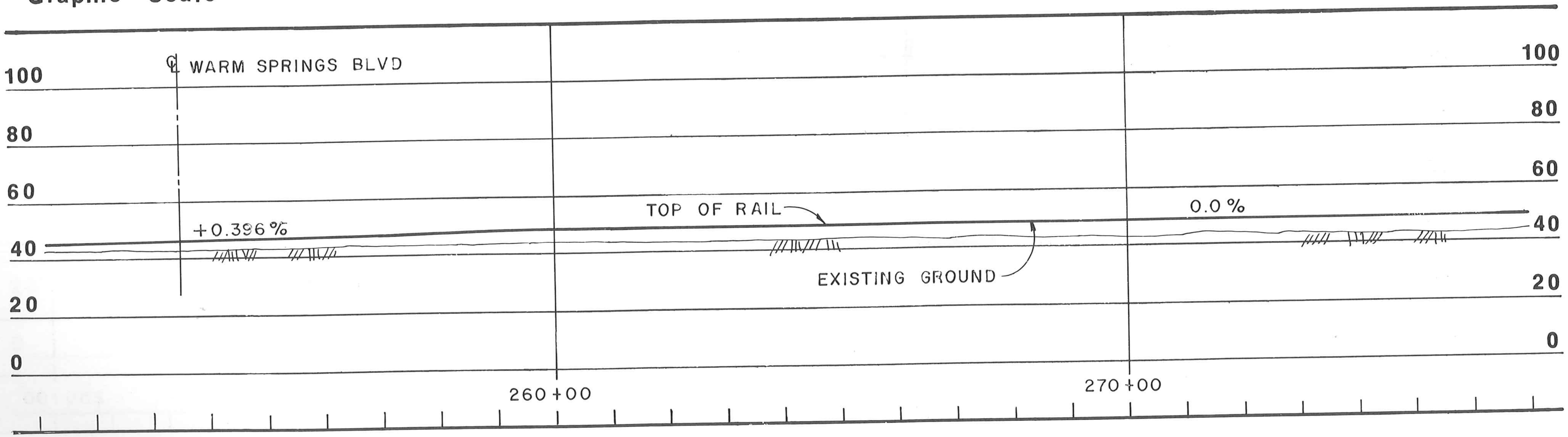

RELOCATED WPRR
210
SPRR
220
SNOBOY
0 100 200 300 400 500 FT
Graphic Scale

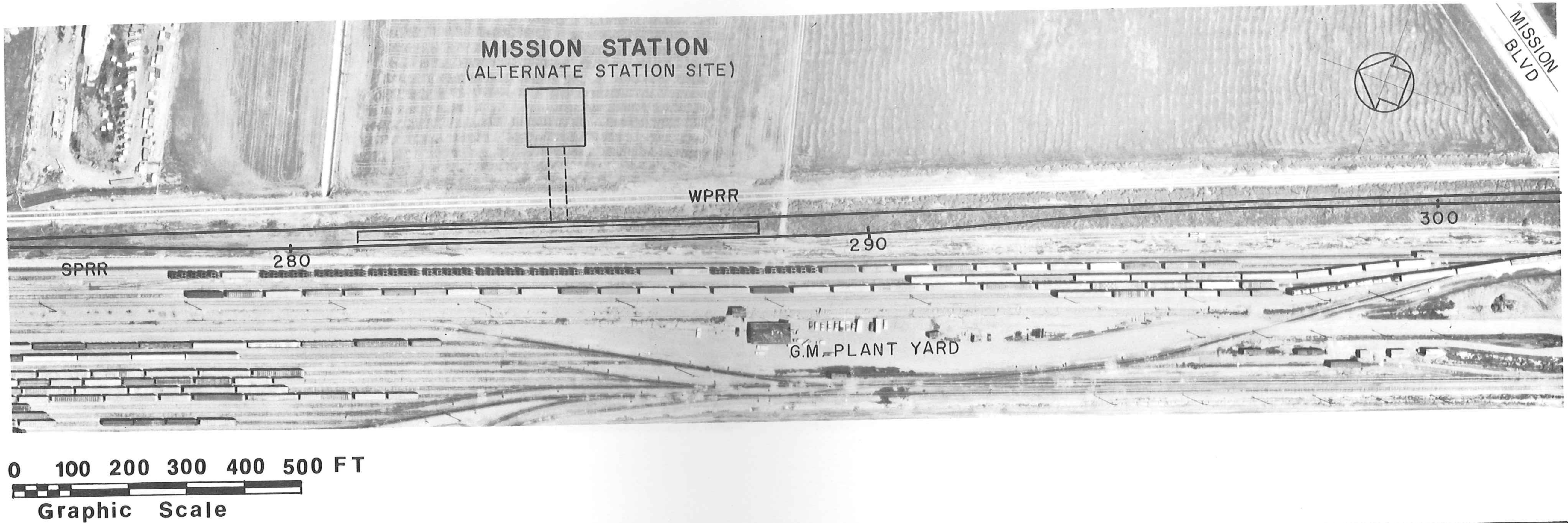

100
80
60
40
20
0
100
80
60
40
20
0
TOP OF RAIL
+0.09%
+0.396%
AT GRADE SECTION
EXISTING GROUND
210+00
220+00

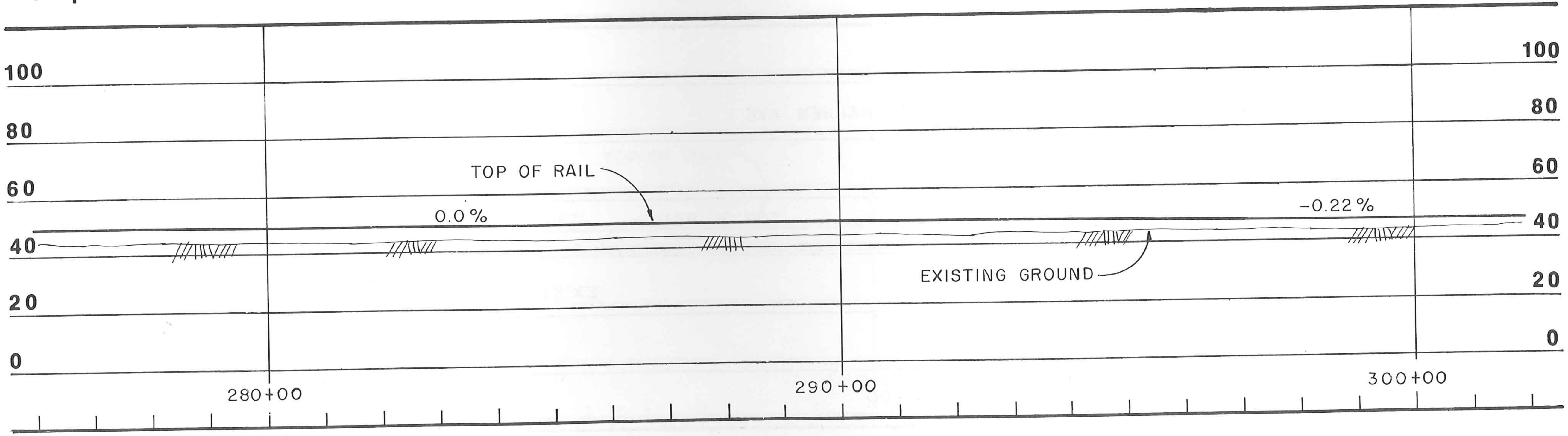

GRIMMER STATION
(ALTERNATE STATION SITE)
RELOCATED WPRR IF
GRIMMER IS TERMINAL
OR MID STATION
RELOCATED WPRR
INLAND
STEEL
AVE
(CLOSED)
PRUNE
(TO BE
UNDERPASS
GRIMMER RD
SPRR
230
240
250
WARM SPRING BLVD (ABANDONED)
0 100 200 300 400 500 FT
Graphic Scale

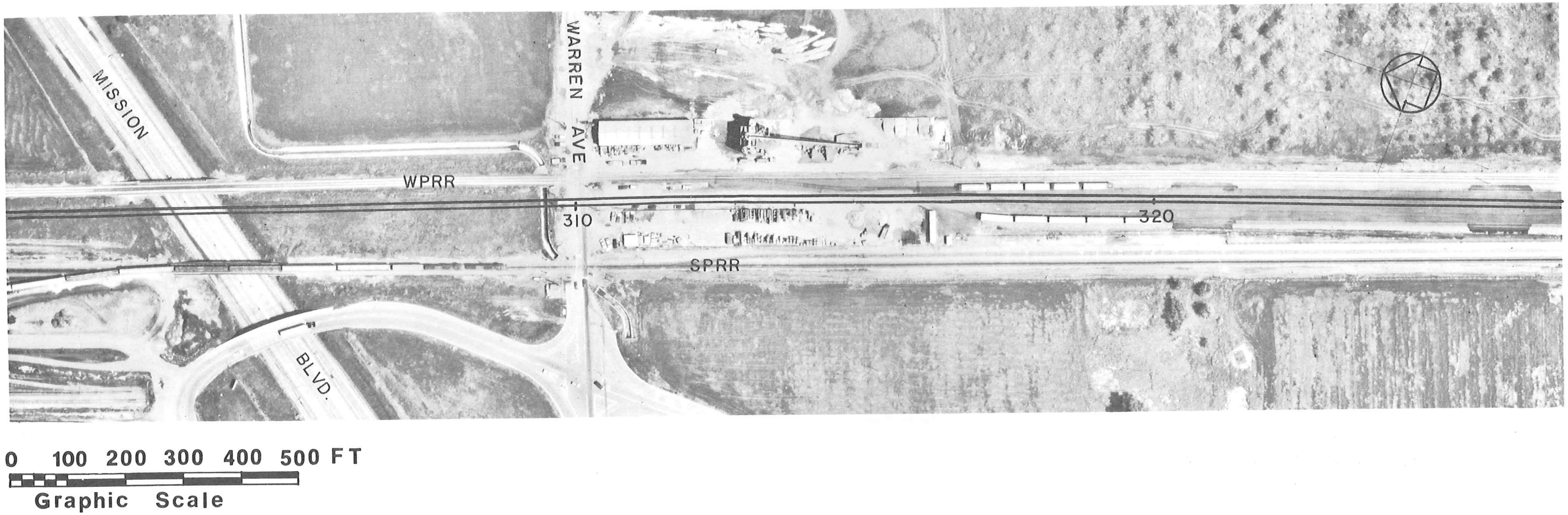

℄ PRUNE AVE
℄ GRIMMER RD UNDERPASS
TOP OF RAIL
EXISTING GROUND
AT GRADE SECTION
100
80
60
40
20
0
230+00
240+00
250+00

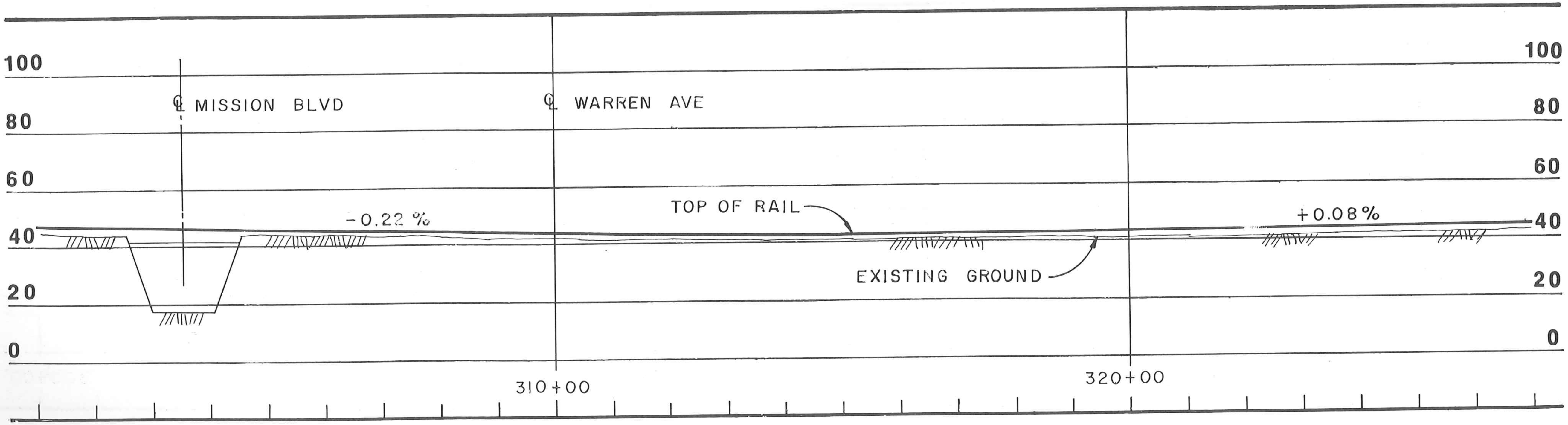

WARM SPRINGS BLVD (ABANDONED)
RELOCATED WPRR
WPRR
260
SPRR
270
G.M. PLANT YARD
0 100 200 300 400 500 FT
Graphic Scale

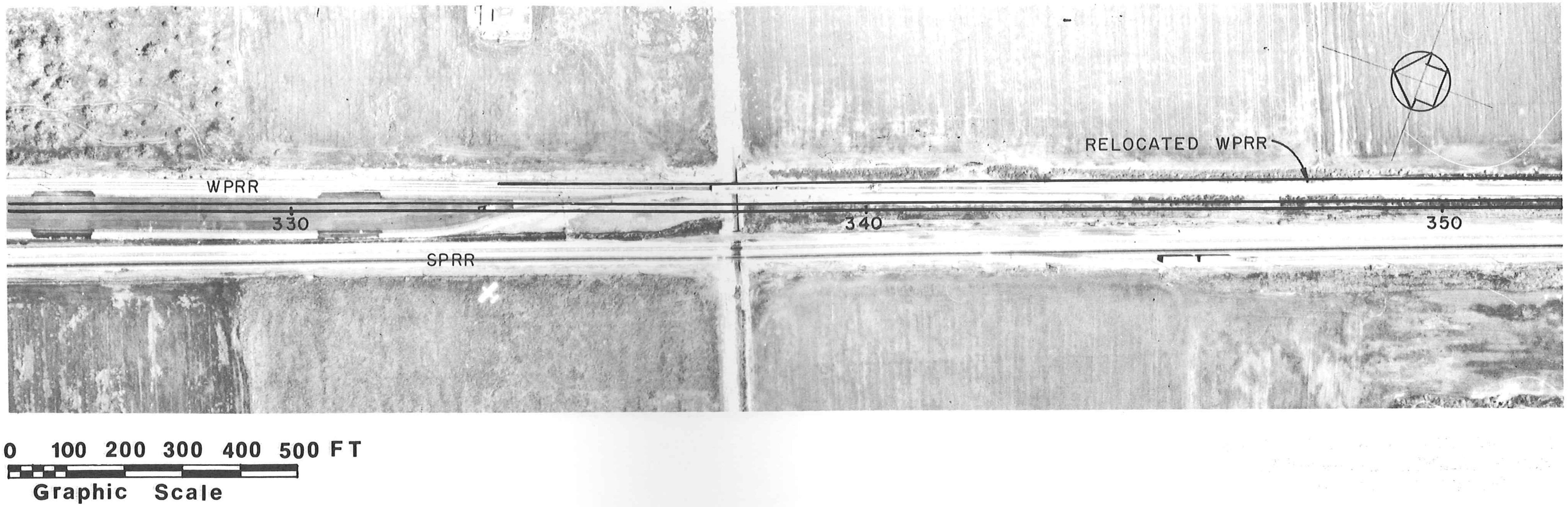

℄ WARM SPRINGS BLVD
100
80
60
40
20
0
+0.396 %
TOP OF RAIL
0.0 %
EXISTING GROUND
260+00
270+00

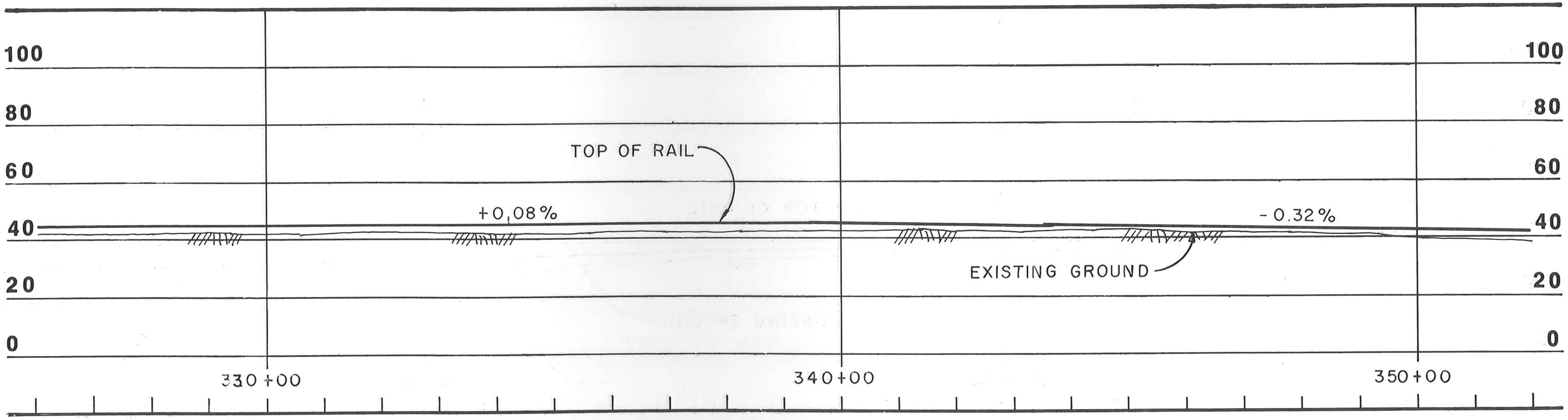

MISSION STATION
(ALTERNATE STATION SITE)
MISSION BLVD
WPRR
SPRR
280
290
300
G.M. PLANT YARD
0 100 200 300 400 500 FT
Graphic Scale

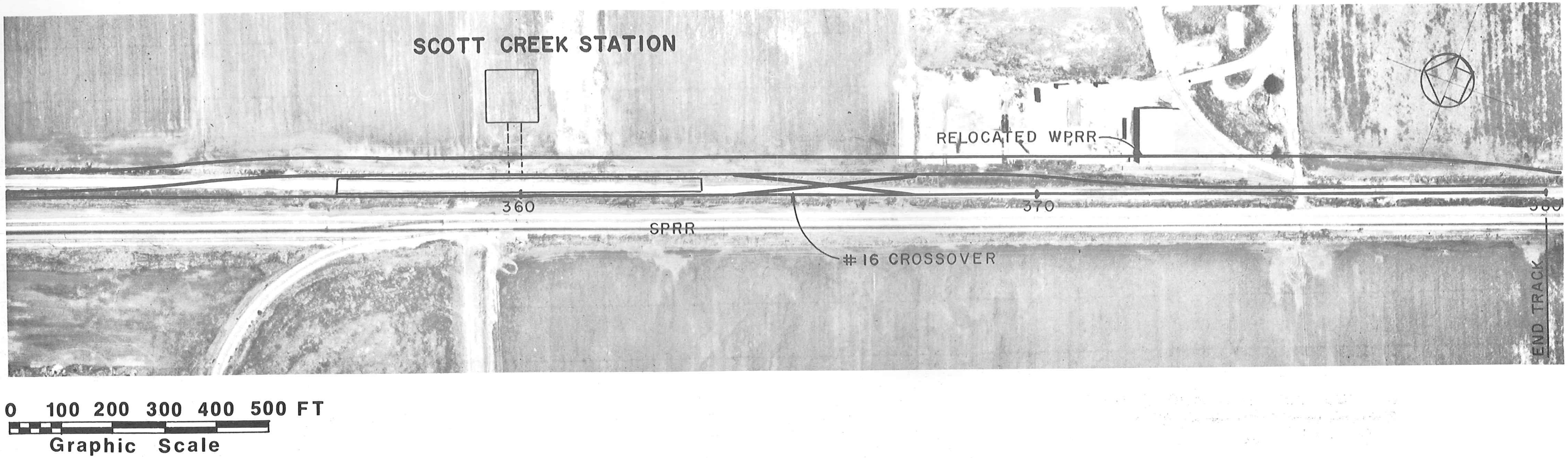

100
80
60
40
20
0
TOP OF RAIL
0.0 %
-0.22 %
EXISTING GROUND
280+00
290+00
300+00

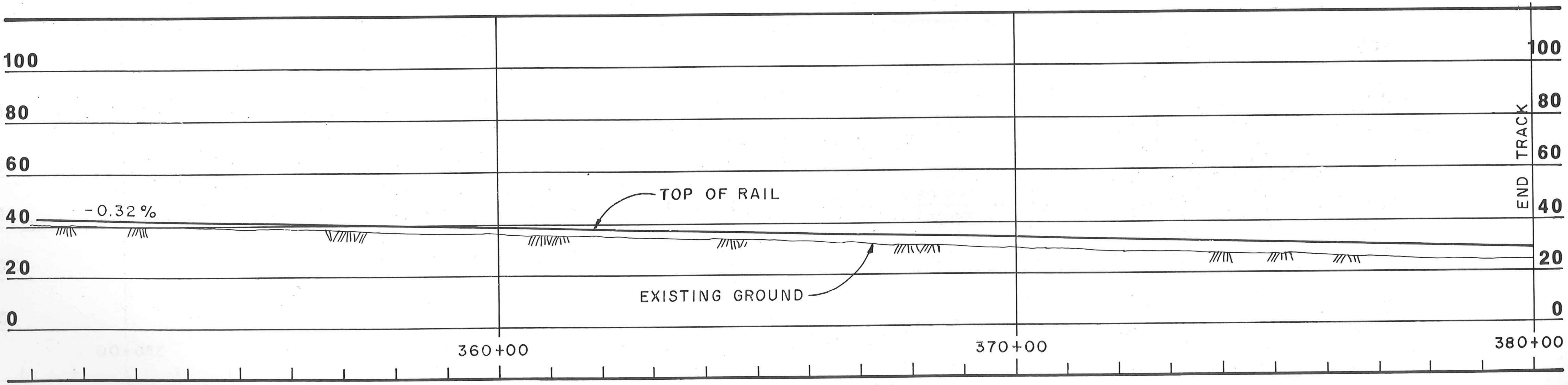

MISSION
BLVD.
WARREN AVE
WPRR
310
320
SPRR
0 100 200 300 400 500 FT
Graphic Scale

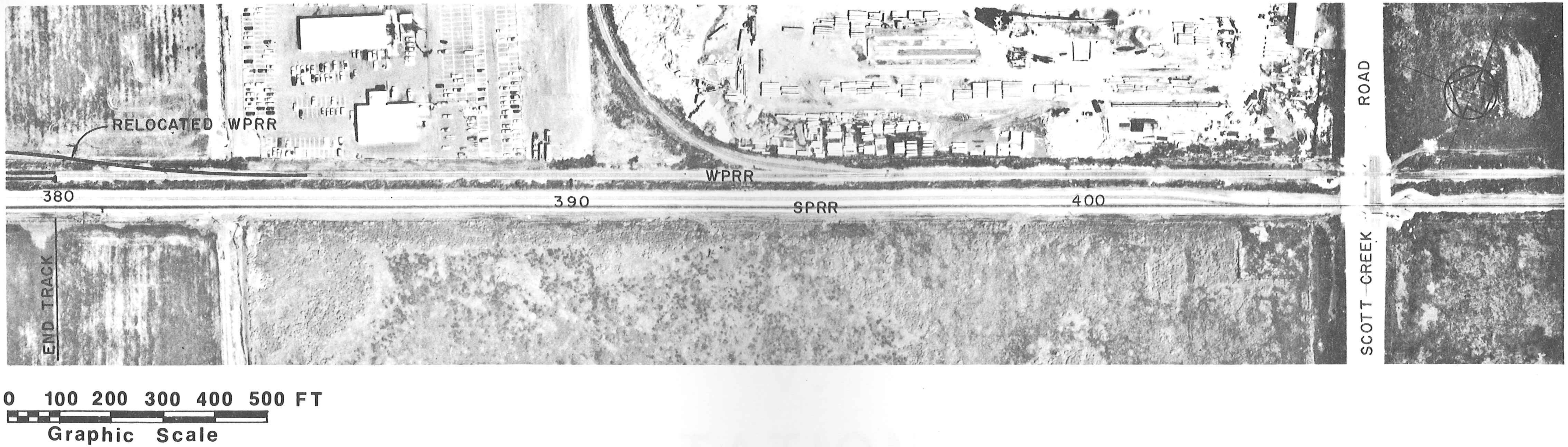

100
80
60
40
20
0
℄ MISSION BLVD
℄ WARREN AVE
-0.22 %
TOP OF RAIL
+0.08%
EXISTING GROUND
310+00
320+00

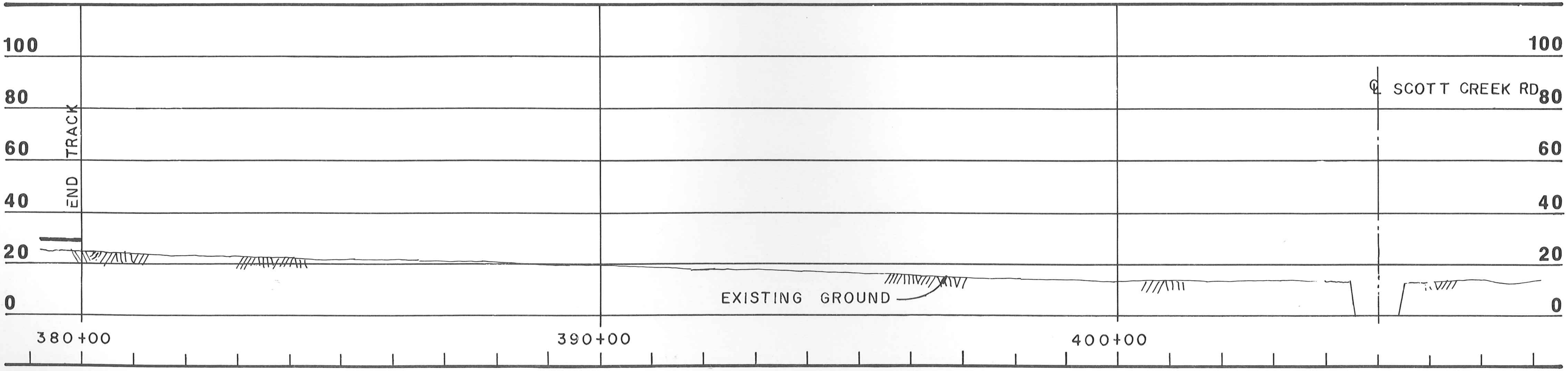

RELOCATED WPRR
WPRR
330
340
350
SPRR
0 100 200 300 400 500 FT
Graphic Scale

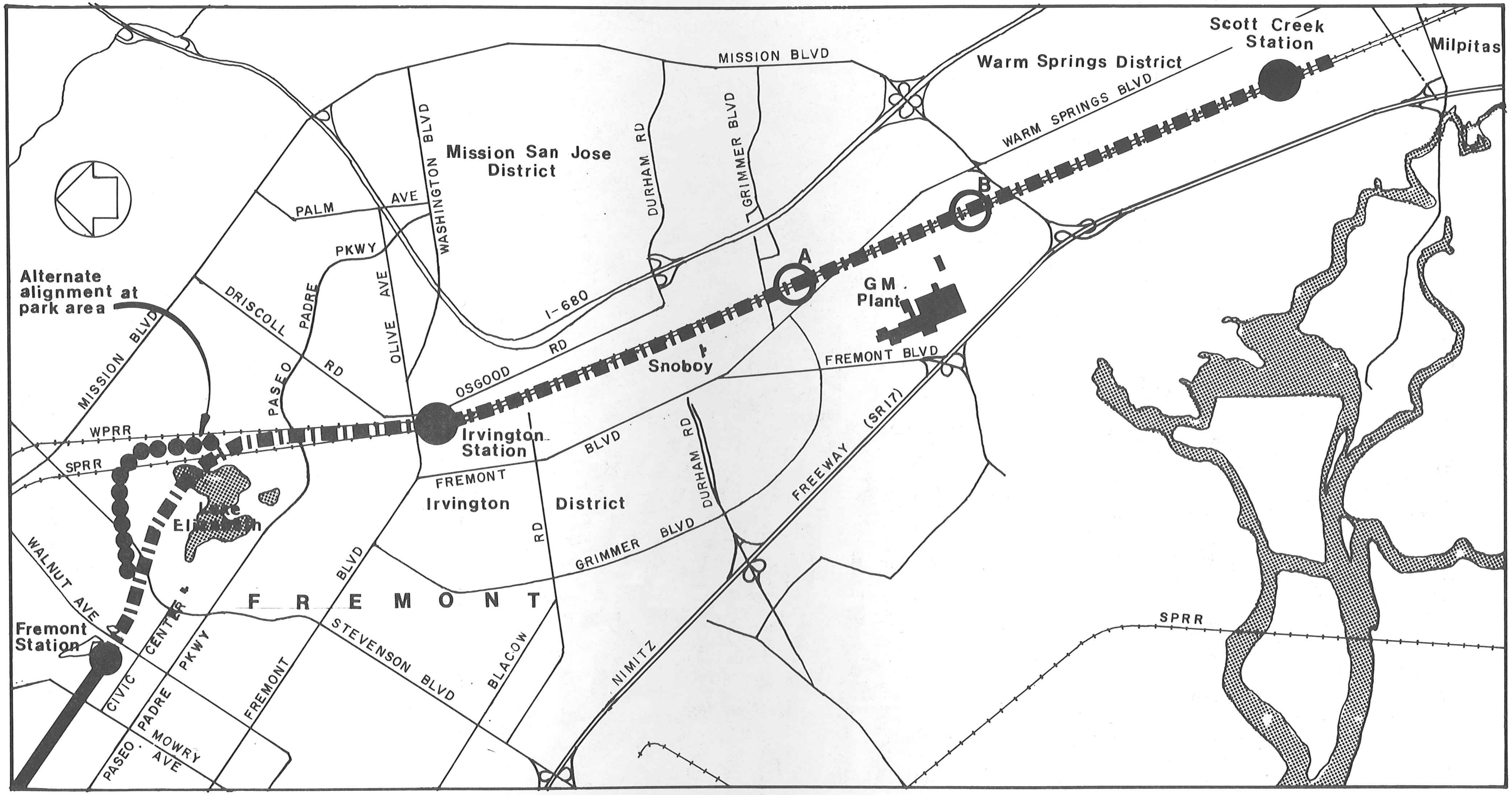

100
80
60
40
20
0
TOP OF RAIL
+0.08%
-0.32%
EXISTING GROUND
330+00
340+00
350+00


SCOTT CREEK STATION
RELOCATED WPRR
360
370
380
SPRR
#16 CROSSOVER
END TRACK
0 100 200 300 400 500 FT
Graphic Scale


100
80
60
40
20
0
-0.32 %
TOP OF RAIL
EXISTING GROUND
END TRACK
100
80
60
40
20
0
360+00
370+00
380+00


RELOCATED WPRR
WPRR
380
390
SPRR
400
END TRACK
SCOTT CREEK
ROAD
0 100 200 300 400 500 FT
Graphic Scale


100
80
60
40
20
0
END TRACK
℄ SCOTT CREEK RD
EXISTING GROUND
380+00
390+00
400+00

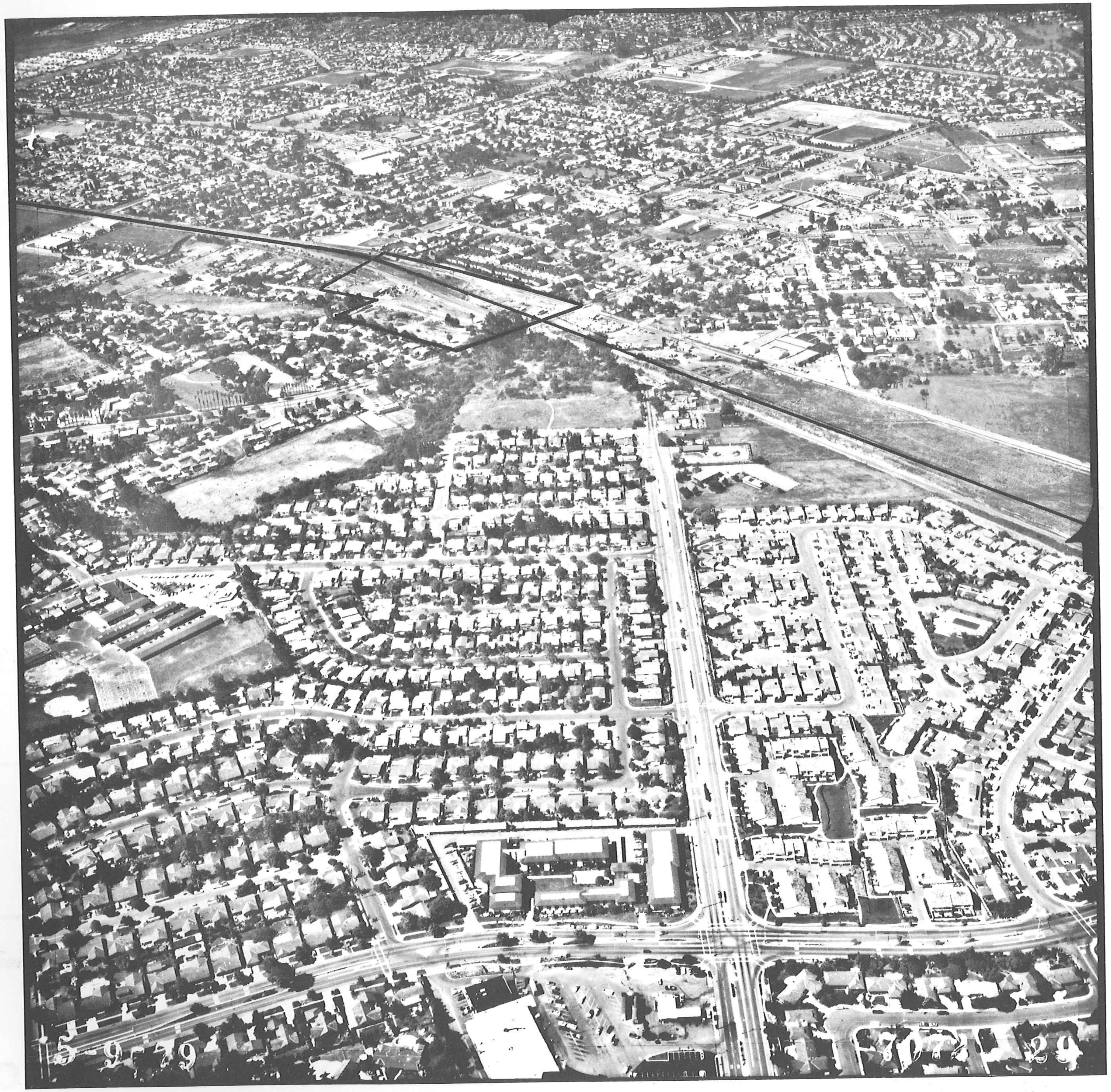


○ Alternate Sites — Warm Springs Station

A — Grimmer

B — Mission

ROUTE LOCATION



IRVINGTON STATION SITE LOOKING TOWARD THE SOUTHWEST.

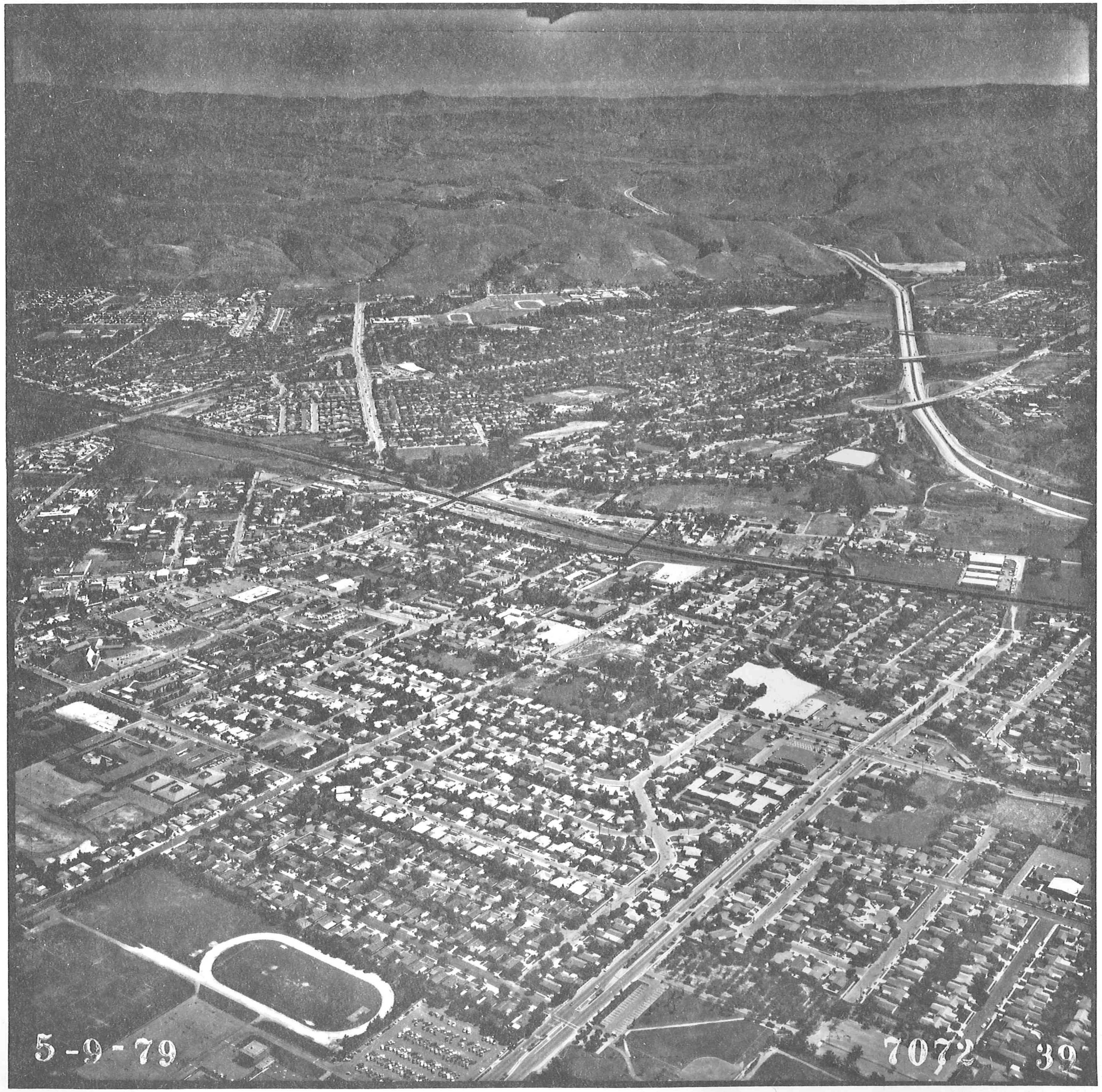
Four general station locations were identified based on local land-use and roadway plans as well as environmental, community and engineering criteria. An iterative review process involving discussions with City staff resulted in the narrowing down of these locations to specific sites. The areas identified are all located within the SP/WP rail corridor with additional land required adjacent to the right-of-way for BART patron parking. The general station locations identified include:

- Washington Boulevard for service to the Irvington District.
- Grimmer Boulevard for service to the Warm Springs District.
- Mission Boulevard for service to the Warm Springs District (this location is considered as an alternative to the Grimmer Boulevard location).
- Scott Creek Road for service to the Warm Springs District and Milpitas.

The first three station locations listed form the basis for a two-station extension for which patronage data were developed (see Section VII on page ___). The Scott Creek station location was added at the request of Fremont City staff and is presented here for identification and cost purposes for a three-station extension to the county line. Preliminary designs and more detailed information with regard to each proposed station are as follows:

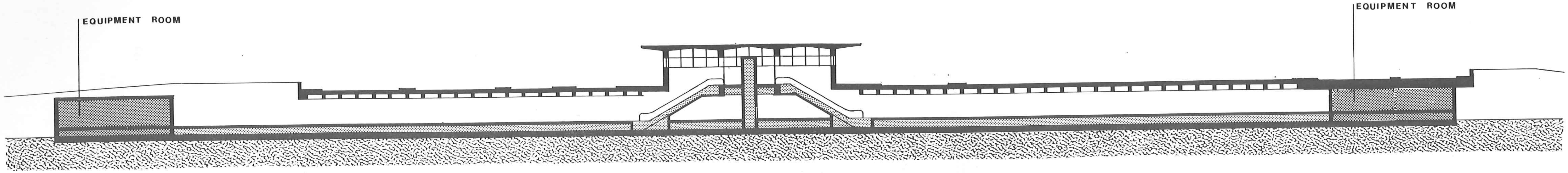
WASHINGTON BOULEVARD: IRVINGTON STATION

A BART station in this location is consistent with the City's redevelopment plans for the Irvington District. The station would be located south of Washington

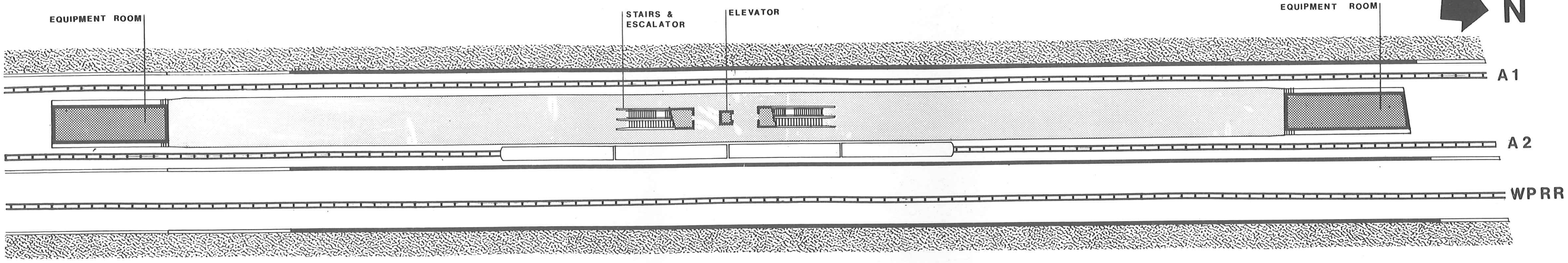


IRVINGTON STATION SITE LOOKING TOWARD THE NORTHEAST.

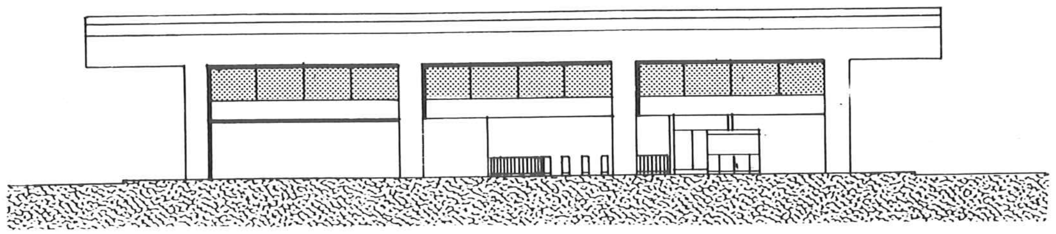
Boulevard convenient to both residential and commerical areas. The City is proposing to realign Osgood and Driscoll Roads where they join Washington Boulevard. Washington Boulevard is planned to cross over the depressed BART-SP/WP rail corridor. These plans have been incorporated into the preliminary design concept for the Irvington station. Two principal parking areas have been identified with a holding capacity of 1,100 vehicles. The first area surrounds the station entrance and concourse occupying land between Osgood Road and the existing SP mainline and extending from Washington Boulevard to a line approximately 1,200-feet south of this roadway. The second principal parking area is located directly adjacent to the first; east of Osgood Road and south of Washington Boulevard. This parcel of land is located on the Hayward Fault and is presently undeveloped. Vehicular access is linked to Washington Boulevard and Osgood Road incorporating exclusive bus lanes into the circulation pattern. The design of this station is partially tied to the two route alternatives for the southern segment (Section IV, page 34). The minimum depressed right-of-way alignment will require both the SP/WP mainline and BART tracks to ascend to grade south of the Irvington station. Height clearances subsequently require the ascending below-grade tracks to be uncovered within 100-feet south of where the parking lot circulation roadway crosses the depressed tracks. North of this point the depressed right-of-way is far enough below grade to permit surface roadways and parking directly above the tracks. The extended depressed right-of-way alignment on the other hand, does not require a track ascent in this location. This situation results in an opportunity to increase the parking area capacity by "covering" the depressed rail right-of-way. An additional 100 parking spaces can be provided in this manner.



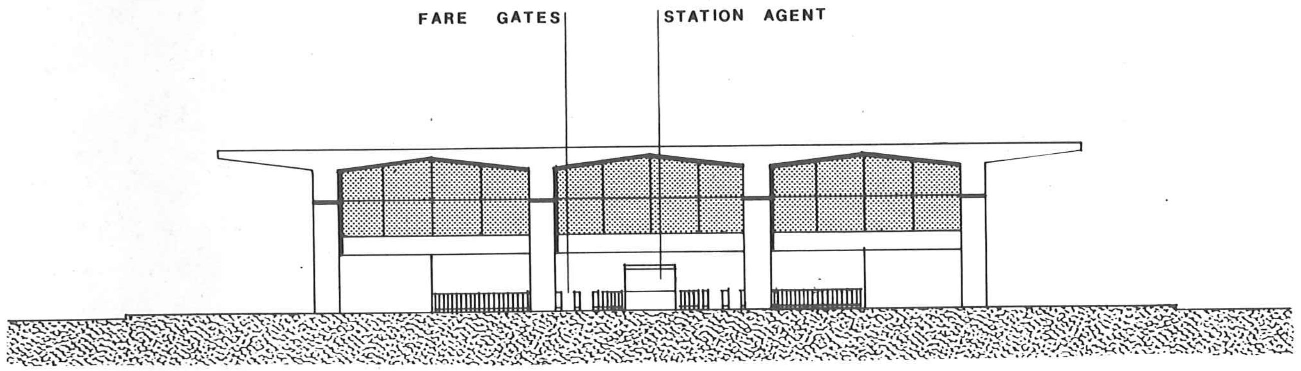
LONGITUDINAL SECTION



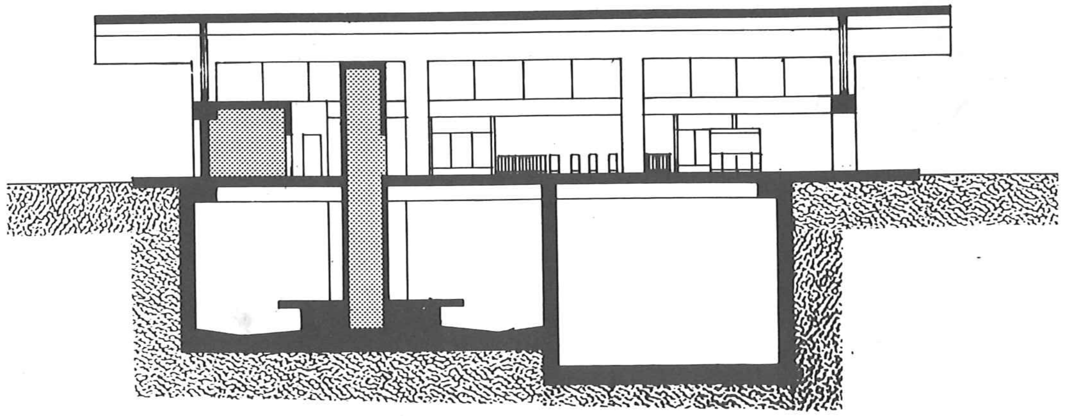
PLAN - PLATFORM



SOUTH ELEVATION

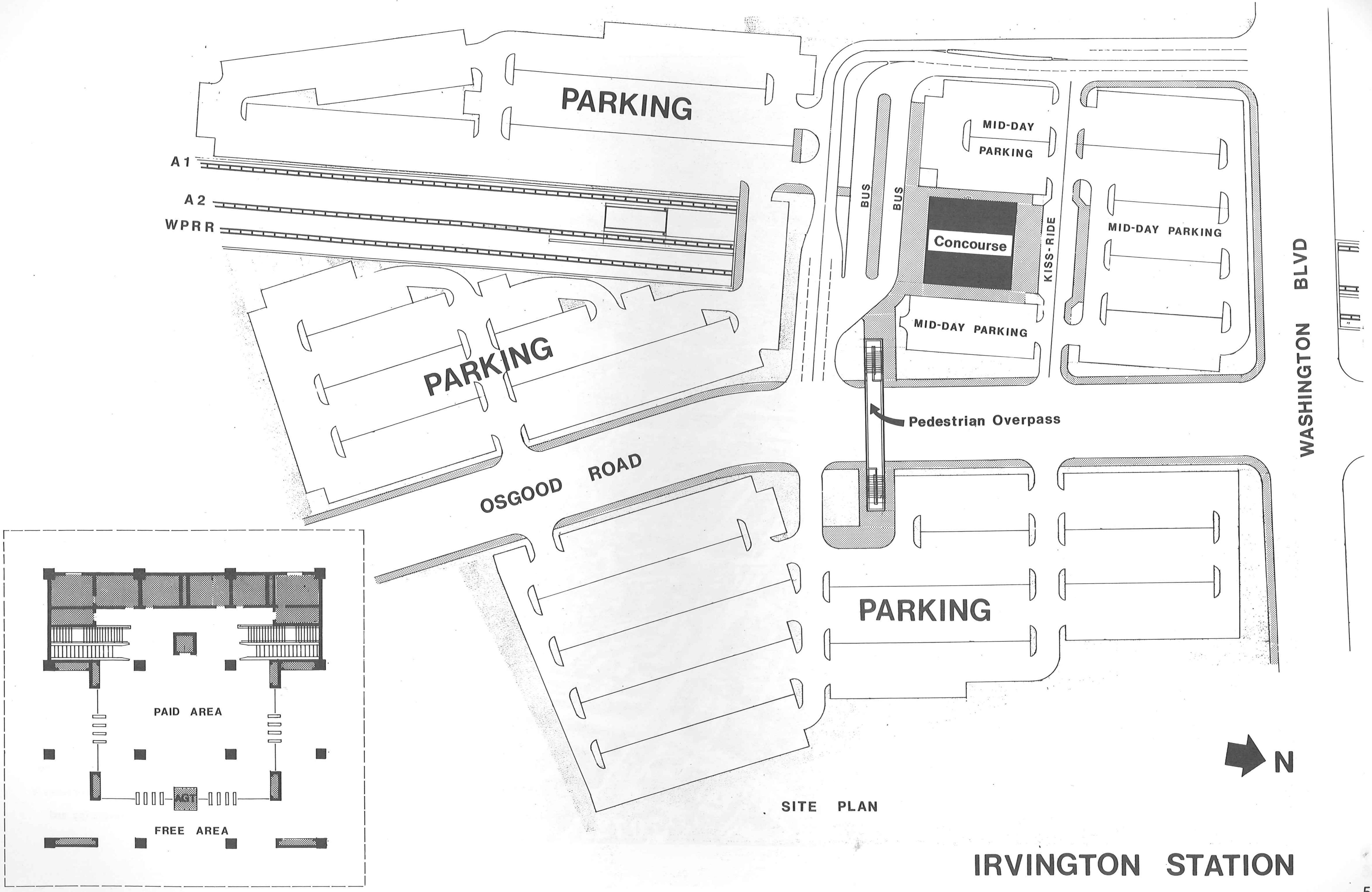


EAST ELEVATION



CROSS SECTION - CENTROID

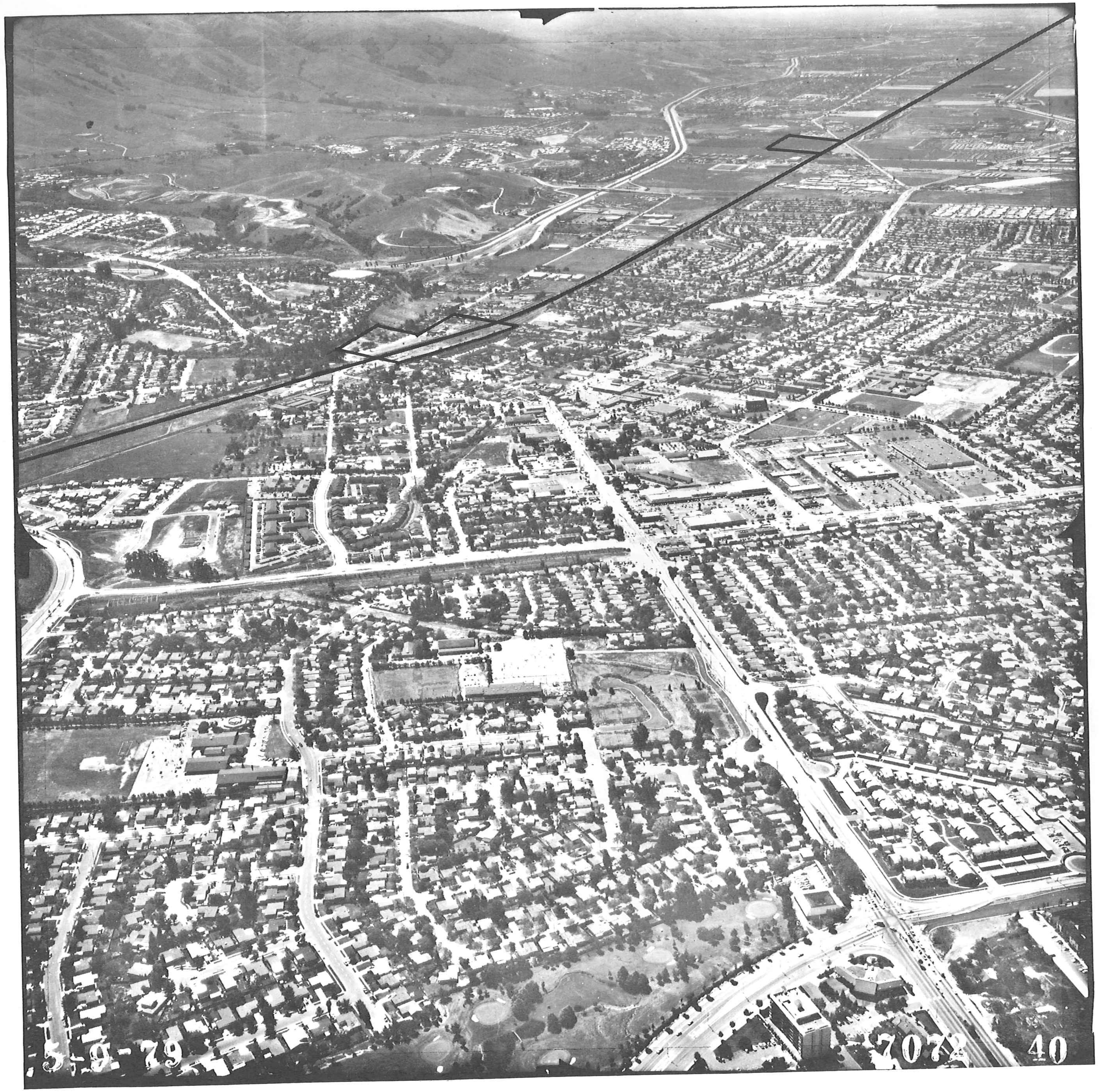
IRVINGTON STATION



SITE PLAN

CONCOURSE PLAN

IRVINGTON STATION

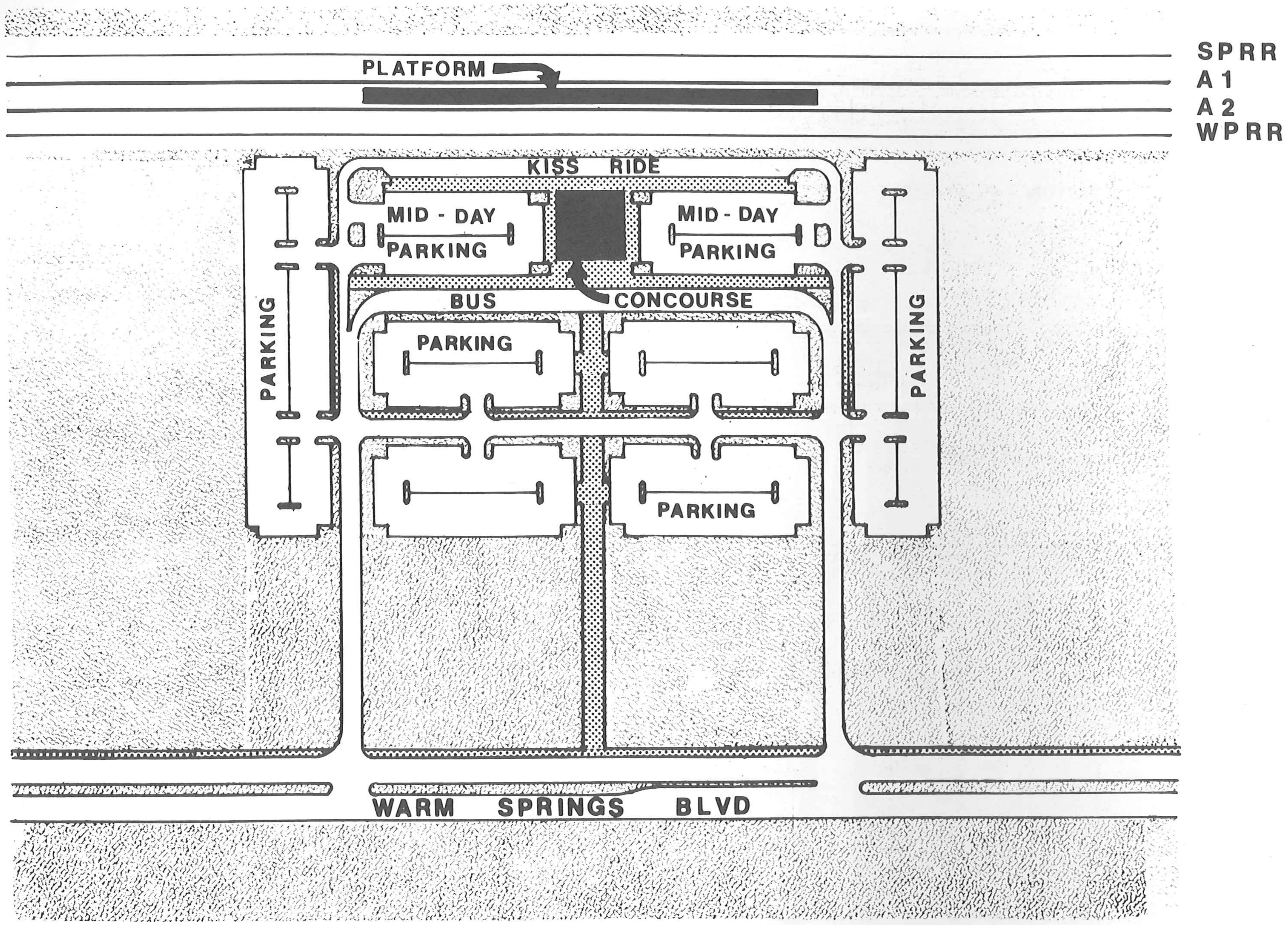


SOUTHERN PORTION OF THE ALIGNMENT LOOKING TOWARD THE SOUTHEAST. GRIMMER STATION SITE IS IN THE UPPER RIGHT CORNER. IRVINGTON STATION AT LEFT.

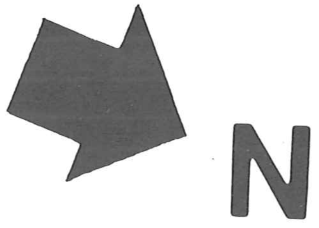
GRIMMER BOULEVARD: WARM SPRINGS STATION (ALTERNATIVE)

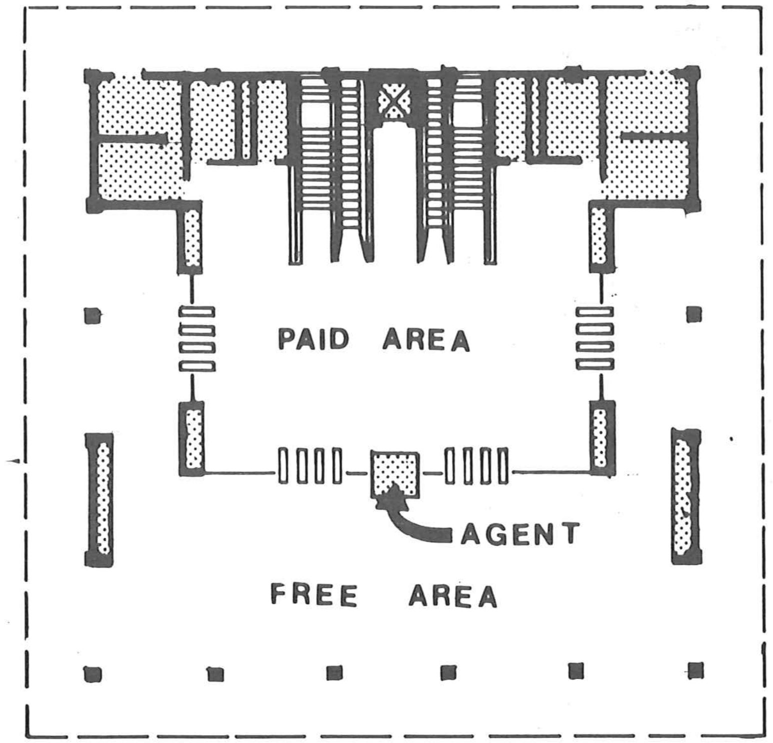
A potential Warm Springs station location has been identified in the vicinity of Grimmer Road. Investigation of this general location led to the selection of a 22-acre site situated east of the rail corridor and 200-feet south of the budgeted Grimmer Road underpass and roadway extension. The plans for this rail grade separation project were reviewed and incorporated into the preliminary design of this extension. The proposed rail configuration in this area would require a pedestrian underpass linking the at-grade station platform with the 1,000 vehicle parking area to the east. An opportunity exists to extend this underpass to the west in view of the potential patron demand associated with the General Motors assembly plant located less than one-half mile to the southwest. This facility currently employees approximately 6,825 people and assuming a modest 5 - 7% transit diversion, the GM plant access demand could generate between 700 to 1,000 BART trips daily. The Grimmer Station would be similar to the Richmond BART station where a pedestrain mall provides direct access from both sides of the SP/BART rail corridor. The surrounding land-use is industrial with residential areas within one-mile both to the east and north. Access to the station would be tied to a planned extension of Osgood Road with direct connections to Grimmer and Warm Springs Boulevards. This latter roadway is to be closed to through traffic at the rail right-of-way. With the set back of the station parking area approximately 300-feet west of Osgood Road, space for parking expansion will be available as required by future demands.

Should the Grimmer Boulevard site be selected as the new BART terminus, the total extension would be approximately 4.8-miles in length. This includes a 1,200-foot tail track beyond the terminal station for train reversing and storage procedures.



SITE PLAN

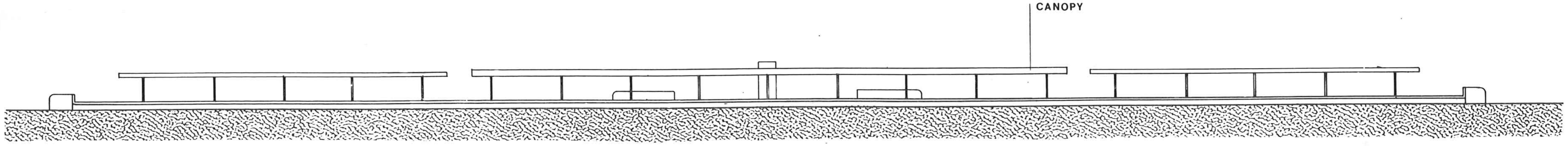




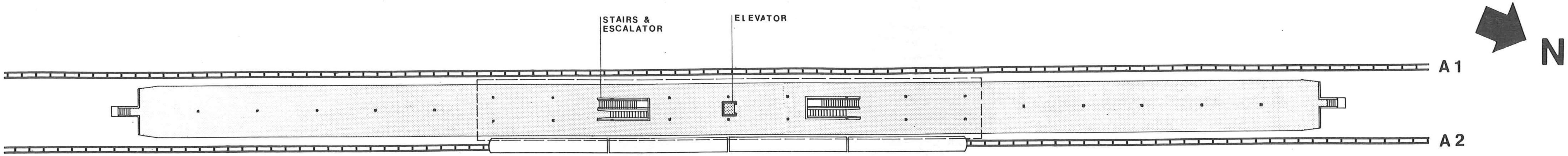
CONCOURSE PLAN

WARM SPRINGS STATION

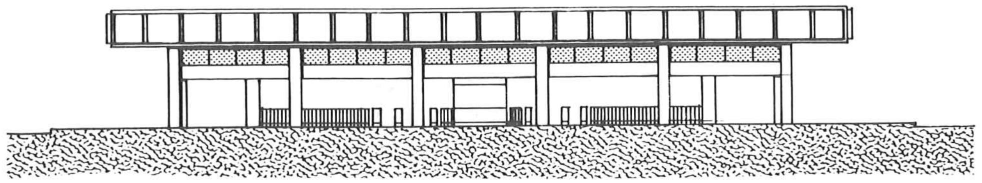
WARM SPRINGS STATION



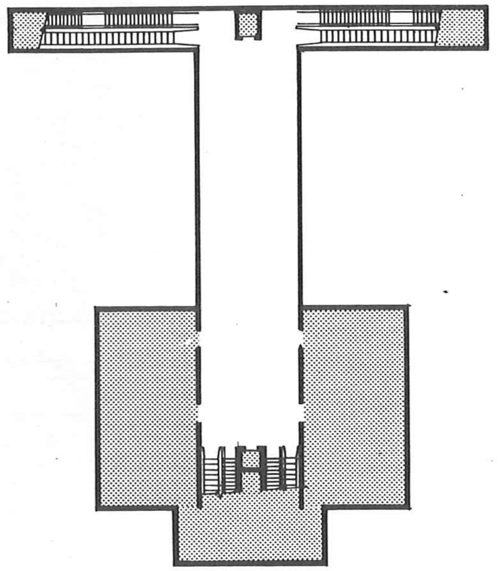
ELEVATION - PLATFORM



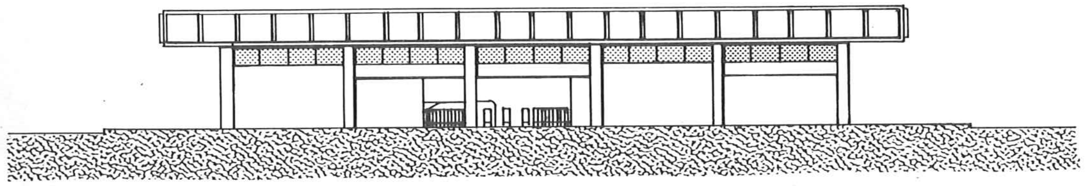
PLAN - PLATFORM



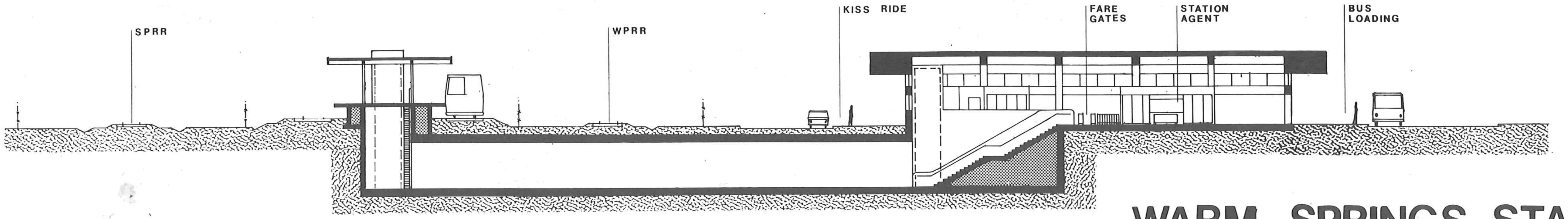
EAST ELEVATION



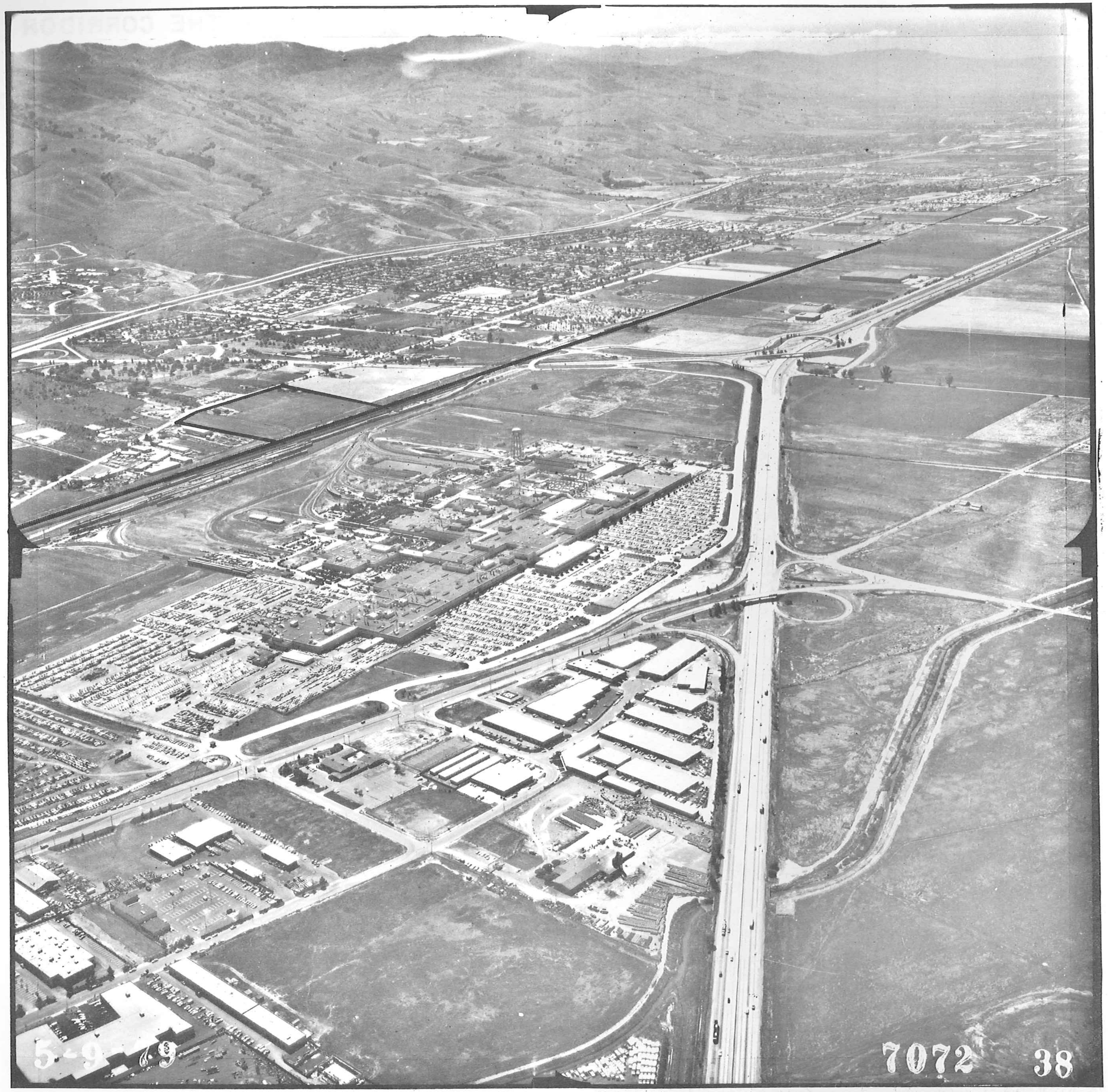
PLAN - UNDERPASS



SOUTH ELEVATION



CROSS SECTION



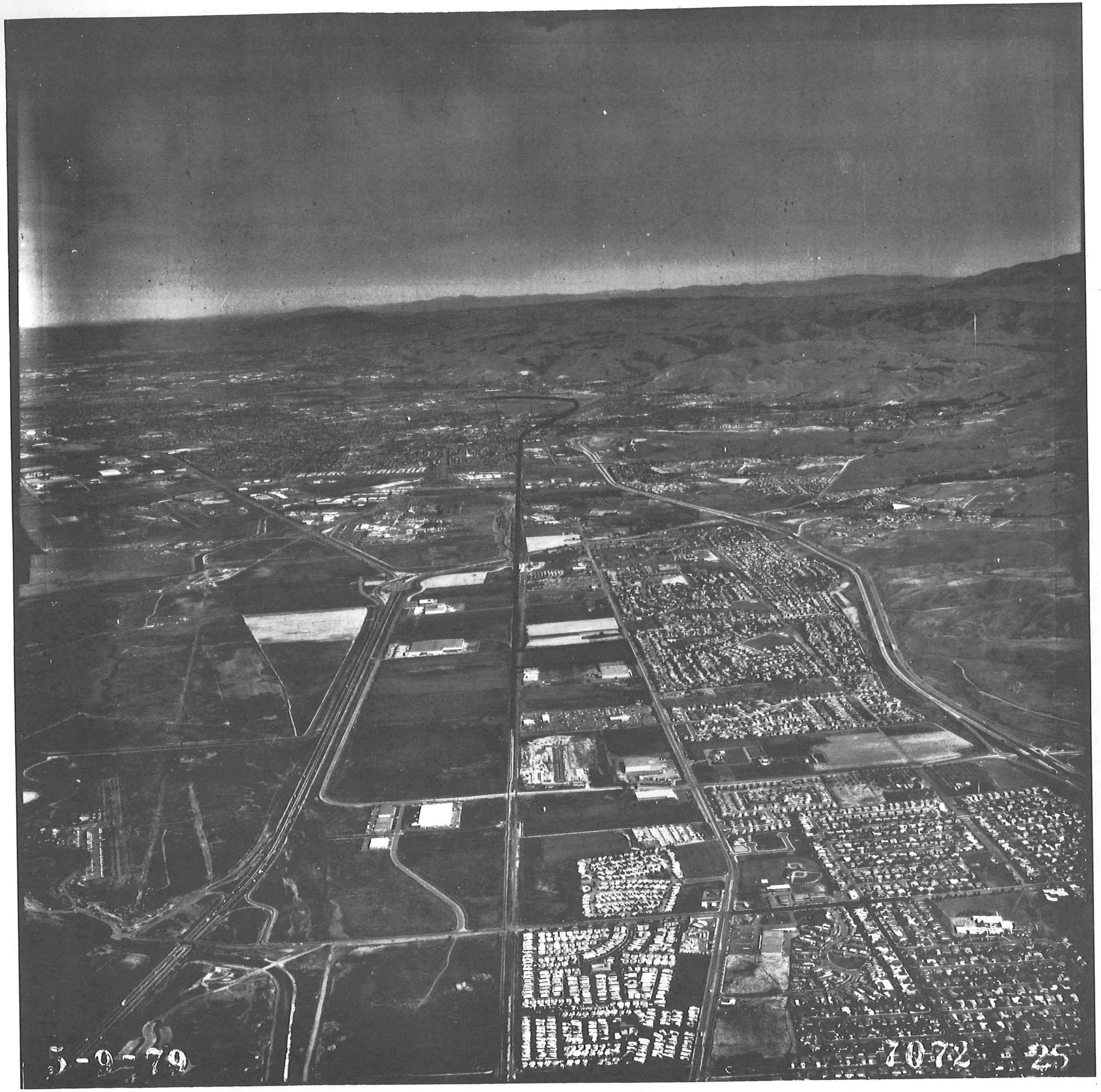
MISSION BOULEVARD STATION SITE AND THE GENERAL MOTORS PLANT LOOKING TOWARD THE SOUTHEAST.

MISSION BOULEVARD: WARM SPRINGS STATION (ALTERNATIVE)

A potential Warm Springs station location also has been identified in the vicinity of Mission Boulevard. Investigation of this general location resulted in the selection of a site situated approximately one-fourth mile north of Mission Boulevard and east of the rail corridor. Primary factors which favor this location over others investigated in this general area are peak-period traffic circulation and costs. By locating the station somewhat removed from Mission Boulevard, the distribution of traffic tends to spread out over a number of local roadways rather than concentrating on Mission Boulevard. This is particularly critical in view of the extremely large volume of traffic forecast for this roadway in conjunction with the Nimitz freeway. Additionally, considerable cost savings are incurred as a result of the selection of this site. A new BART terminal in this location would require a 1,200-foot tail track to be constructed beyond the station platform for train storage and reversing procedures. A station site any closer to Mission Boulevard would require a new bridge to support the tail tracks over the depressed roadway. The selected site eliminates the need for this facility.

The station preliminary design is identical to the Grimmer Boulevard station plan. The surrounding land-use is industrial with residential areas located within one-mile both to the east and to the southeast. The General Motors assembly plant is located 3/10-mile directly west of the station site.

The selection of this station as a new BART terminal will require an extension of rail service for a distance of 5.7-miles including the tail track beyond the station.



SOUTHERN PORTION OF THE CORRIDOR LOOKING TO THE NORTH. SCOTT CREEK STATION SITE IS IN THE LOWER PORTION OF THE PHOTO WITH RESIDENTIAL AREAS IN THE CITY OF MILPITAS IMMEDIATELY TO THE SOUTH.

SCOTT CREEK ROAD: SCOTT CREEK STATION

The original concept of a Warm Springs BART extension was formulated on the basis of providing rail service to two new stations within the City of Fremont. The use of these stations by Santa Clara residents cannot be ignored however, and as a result, the opportunity for including a third extension station near the county line was investigated. This addition to the study was largely based on the desire to reduce automobile traffic loads on major roadways through Fremont; Mission Boulevard in particular. An investigation of the general location resulted in the selection of a site situated 4,500 feet north of Scott Creek Road and east of the rail corridor. The preliminary station design is identical to the Grimmer Boulevard plan. The surrounding land-use is industrial with residential areas located in the City of Fremont to the east and in the City of Milpitas approximately one mile to the south. Access to the station would be off Warm Springs Boulevard with connections to I-680 and the Nimitz freeway at a distance of about one-mile. A new BART terminal in this location will require a 7.1 mile rail extension including a tail track facility.

Relevant criteria were identified as a means of facilitating an evaluation of the project in a manner consistent with the study scope and objectives. The factors selected focus on aspects of extending BART to Warm Springs as viewed from local and regional concerns as well as from a technical engineering and operational perspective. This section is concerned with impact criteria which relate to local and regional concerns. Discussions concerning BART engineering and operational aspects of the project appear in Parts IV. Route Descriptions, V. Station Locations, VII. Patronage, VIII. Fares and Revenues, and IX. Costs.

LOCAL CONCERNS: CITY OF FREMONT

Seven prime factors were identified for the purpose of assessing the potential community impacts of a BART extension. The following is a summary of pertinent findings with respect to each factor as they relate to the route alignments and station locations described in Parts IV and V of this report.

FACTOR 1: LAND USE COMPATIBILITY

A future BART alignment lying within the SP/WP rail right-of-way is viewed as being consistent and compatible with general land-use planning goals for the City of Fremont. A below-grade track configuration is preferred by the City as a means of minimizing any potentially negative impacts to adjacent sensitive land-uses particularly with regard to noise and visual aesthetics. For this reason, the extended depressed right-of-way alternative is the preferred alignment from Fremont's perspective. Blacow Road in this case would be extended at grade over the rail corridor. The minimum depressed alignment, on the other hand, requires the SP/WP consolidated mainline and BART tracks to ascend to grade in order to accommodate a Blacow Road undercrossing. This location lies directly adjacent to a residential area with homes within 50-feet of the proposed at-grade tracks.

Similarly, the subway alignment through the park is the most preferred alignment from the City's perspective since noise and visual impacts are effectively mitigated with this configuration. A BART alignment in the vicinity of the park, however, has officially been removed from the City's general plan based on potential disruption to the park.

The Irvington station location is identified in the City's general plan and is subsequently viewed as being consistent and compatible with the City's land-use goals. The remaining station sites located at Grimmer Road, Mission Boulevard and Scott Creek Road are not contained in the general plan but are viewed as being compatible with the City's land-use goals on the basis of surrounding industrial land uses. Of the two Warm Springs station site alternatives, the Grimmer Road site is preferred by the City to a Mission Boulevard location on the basis of the projected traffic volumes for the latter roadway. Grimmer Road is expected to be much less traveled and is consequently viewed as a potentially more effective access route to a BART station.

FACTOR 2: COMMUNITY CIRCULATION IMPACT (BARRIER EFFECT)

The physical presence of a BART line through Fremont is not expected to have a significant negative impact on circulation patterns. This is based on the fact that the City is already bisected by the SP/WP rail corridor. Although the addition of BART within this right-of-way will require a fully protected (fenced) path, opportunities do exist to implement roadway and pedestrian grade separations which will actually improve circulation by ensuring a safe unimpeded crossing environment. The two aerial alignments through the park will not impose an impenetrable barrier to circulation. The track structure allows for free access of pedestrians, bicycles and maintenance vehicles within all sections of the park. The structure support columns spaced approximately 70- feet apart are the only barriers associated with these two alignments. The subway alternative is the preferred route through the park from a City perspective since this alignment does not alter the park environment.

FACTOR 3: STATION ACCESS IMPACT

The most significant traffic related impact will be a reduction in the Fremont station's access demand as BART patrons shift to more conveniently located extension stations. Consequently, automobile traffic should be significantly reduced in the vicinity of the Fremont station as the extension stations absorb on the order of 8,800 former Fremont station trips (access plus egress trips) on an average weekday. Similarly, with the reassignment of all Santa Clara buses to the new BART terminus, bus traffic will also be reduced in the vicinity of the Fremont station. The absorption of these and other induced trips by the extension stations will, however, require local roadways to accommodate BART access travel in addition to travel for all other purposes.

- The Irvington station is forecast to generate 3,765 auto trips in the vicinity of the station each weekday; 2,110 of which will occur during the four peak-travel hours. In addition to this, 30 to 40 buses are likely to enter and exit the station during each peak-hour and 15 to 20 during each off-peak hour.
- A new BART terminus at either Grimmer Road or Mission Boulevard is projected to generate 2,670 auto trips in the vicinity of the station each weekday; 1,370 for which will occur during the four peak-travel hours. With the reassignment of Santa Clara buses to the new BART terminus, 50 to 60 buses are likely to circulate through the station during each peak-hour. This includes local bus service improvements in the Warm Springs area.
- No estimate has been developed for the Scott Creek station but a preliminary investigation reveals that a station in this location would reduce traffic on local roadways within Fremont due to the capture of Santa Clara BART access trips in this location.

Based on the projected access demands, the Grimmer Road site is preferred to Mission Boulevard based on the expected future utilization of these two roadways. The Grimmer site tends to distribute traffic over a variety of local arterials while relying on Fremont Boulevard for access to the Nimitz freeway rather than heavily-used Mission Boulevard. The assumed local road network in the vicinity of the Irvington station appears to be capable of accommodating BART access travel in addition to non-BART related traffic. Residential areas in the vicinity of the Irvington station could be negatively impacted as a result of BART patron parking demands. The provision of adequate parking at the station will mitigate this potential problem.

FACTOR 4: CONSTRUCTION IMPACT

Construction of a BART line and stations involves a lengthy process which can result in varying degrees of impact depending upon location and track configuration. For the park alternatives, the subway alignment is expected to involve approximately 24-months construction time. This route also requires draining a portion of Lake Elizabeth. The work would be completed in sections assuring access from one side of the park to the other. The aerial direct route is estimated to require 12 months for completion with considerably less disruption compared to the subway line. The additional 1,800 linear feet of track for the aerial indirect route results in a construction period of approximately 18 months. In terms of the overall impact, the additional six months needed for the construction of this route is partially offset by the alignment's more remote location within the park.

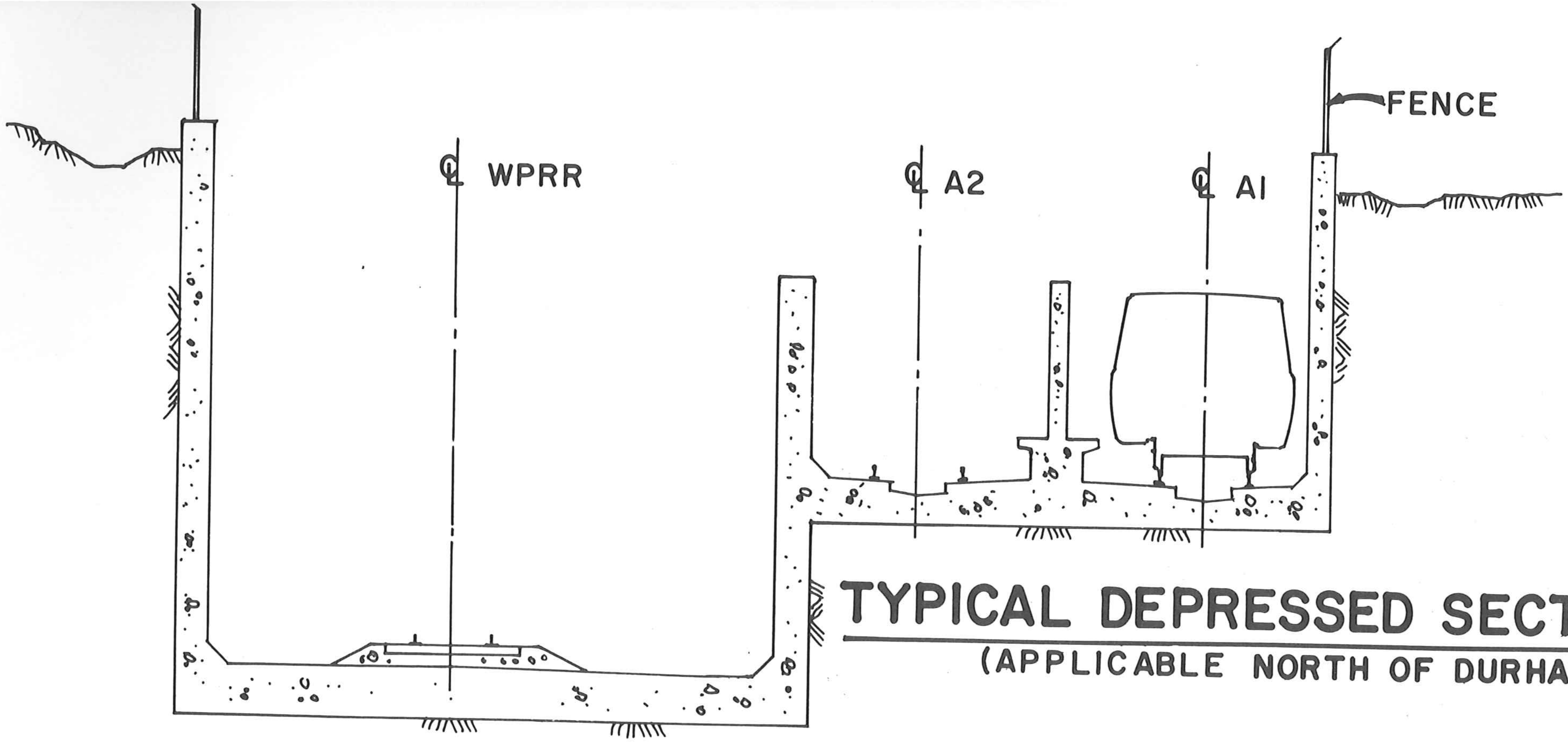
The southern segment will require a maximum of four years to complete assuming the full three-station extension and the extended depressed right-of-way. Minimum construction time estimates are three years assuming a new BART terminus at Grimmer Road and the minimum depressed right-of-way for the southern segment. Noise and construction-related dust are expected to be significant during typical daytime working hours. These effects will be more apparent where the line is located near residential and open space land-uses; generally, north of Durham Road.

FACTOR 5: DISPLACEMENT IMPACT

An extension to Warm Springs is not expected to require the displacement of a significant number of structures. Based on field investigations of existing structures the extension displacement impact is estimated as follows:

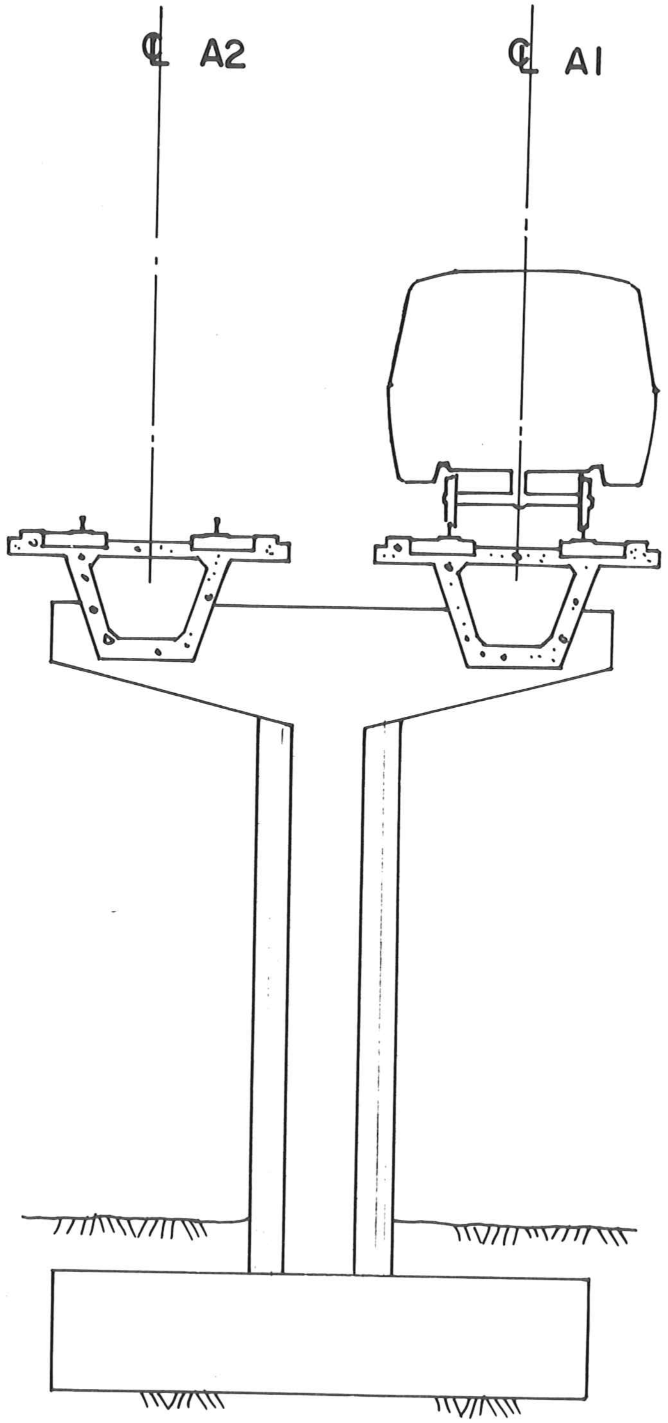
	TERMINAL LOCATIONS		
	Grimmer Blvd.	Mission Blvd.	Scott Creek Road
● Residential Removal (Units)	0	2	2
● Commercial Removal (Establish ments)	2	2	3
TOTAL STRUCTURES REQUIRED	2	4	5

A BART track embankment south of the Fremont station will require the relocation of a flood control relief pond. The area lying immediately east of the Fremont station parking lot has been identified as a possible site for this facility.



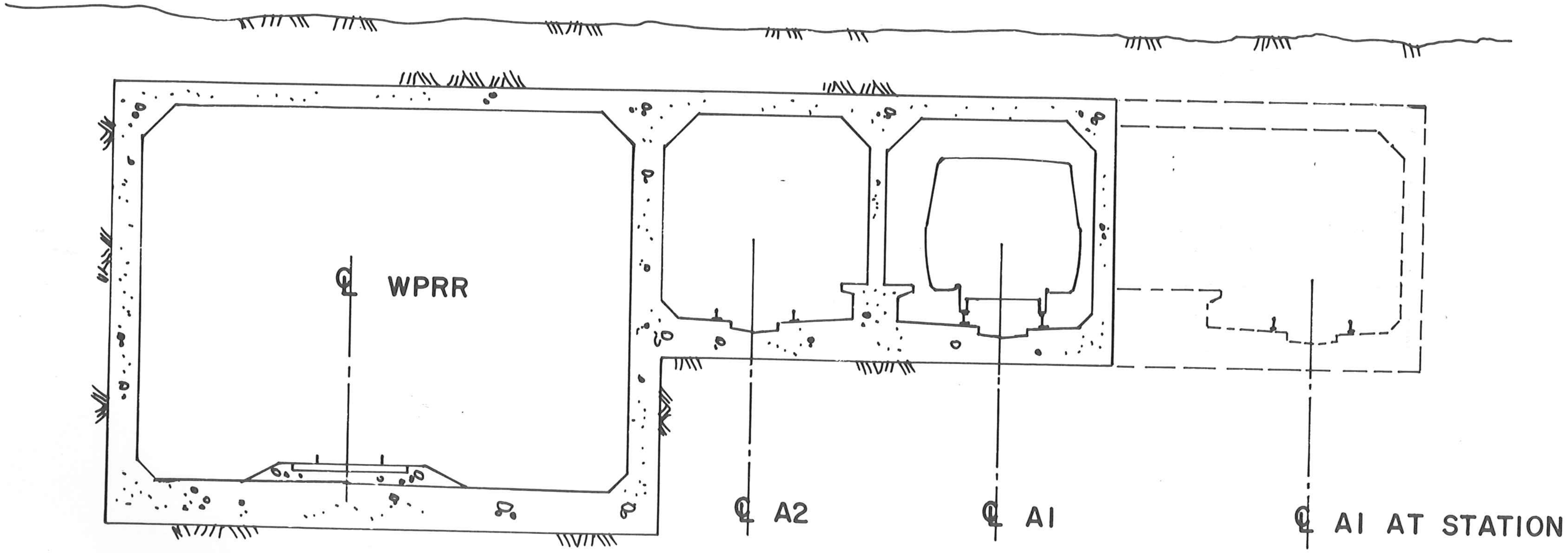
TYPICAL DEPRESSED SECTION

(APPLICABLE NORTH OF DURHAM RD)



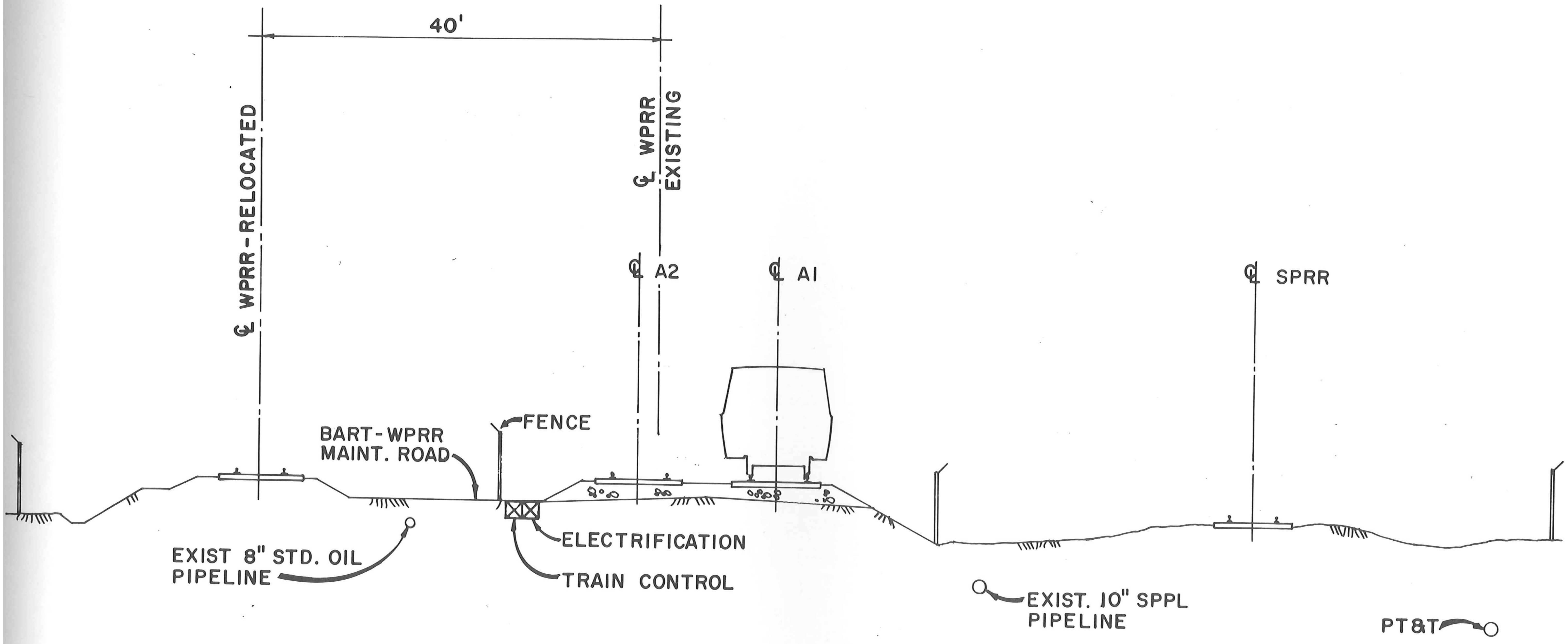
TYPICAL AERIAL SECTION

(APPLICABLE AT PARK AREA)



TYPICAL CUT & COVER SECTION

(APPLICABLE AT VICINITY OF IRVINGTON STATION)



TYPICAL AT GRADE SECTION

(APPLICABLE SOUTH OF DURHAM RD)

FACTOR 6: NOISE IMPACT

The noise impact of BART operation is dependent upon a number of critical factors including:

- Track configuration whether below, at, or above-grade.
- Natural and man-made features which either absorb or reflect sound.
- Train speed.
- Train length.
- Service frequencies for day and night operation.
- Track curvature.
- Presence of track switches or crossovers.
- Ambient community sound levels.

The evaluation assumes that aerial trackways will incorporate sound barriers into the supporting structure design. The effectiveness of this type of sound mitigation measure has been shown to reduce noise emissions by 10 to 13 dBA. On a CNEL basis, BART trains traveling through Fremont Central Park on an aerial track are estimated to produce sound levels approximating between 64 to 68 dBA at 50-feet from the guideway. The subway alternative is obviously the most desirable alignment from a noise emissions perspective. Least desirable is the aerial direct route since this alignment requires a guideway clearance of 35-feet over the lake. Noise is emitted at greater distances at this elevation compared to the 20-foot clearance for a typical aerial configuration. The extended depressed right-of-way is superior in the case of the southern segment due to the absorption of sound within the right-of-way depression. Residential areas lying adjacent to the proposed BART line will experience some impact due to BART's frequency of service. These same areas are already subjected to noise emissions from SP and WP train movements which are louder but occur less frequently than the proposed BART service. Residential development planned to occur between Walnut Avenue and Stevenson Boulevard will need to consider optimum structural positioning and setbacks to minimize the potential noise impact of BART operations. BART noise emissions in this area should be at a lower level than within the park as a result of slower speeds and the encorporation of sound barriers along the trackway. Minimal negative impact is estimated for the areas adjoining the proposed BART line south of Durham Road since the primary activities are industrial.

FACTOR 7: VISUAL IMPACT

The presence of BART conveys a range of visual impacts dependent upon its placement and resultant context within a particular environment. Generally, a positive image is conveyed where BART is thought to be an asset to a community; where potential impacts such as noise are not perceived as a problem. Conversely, where the impacts of BART are perceived as a potential threat to a community life style; invariably, negative images will result. The threat can be in the form of any number of factors including lower home values, loss of privacy, noise, more traffic or blocked views. The collective expression of images often emerges in the form of community sentiment. Largely subjective in nature and based on a variety of sources, community responses to a proposed BART line will be as diverse as the communities themselves; each one expressing a desire to establish or maintain a particular life style within a complex urban area.

The City of Fremont has recently experienced rapid growth, a significant portion of which is associated with the "flight to the suburbs." Here, homes are typically larger than those in more densely populated areas. Large front and back yards are standard elements of the home. Spacious parks and the hills to the east provide a feeling of openness and consequently are also regarded as special community elements. It is within this context that a future BART line must be designed to "fit," safeguarding against any intrusions to these spaces. Containing major transportation facilities to an established corridor is one way of minimizing the overall visual impact. The SP/WP corridor offers this opportunity to a future BART extension in Fremont. Implementation of a depressed rail right-of-way should be perceived as an improvement to the at-grade alignment where the intrusion of private space under current operations is unavoidable, given the rail line's proximity to homes and businesses. The park environment, however, is characterized by quiet, green open space, sensitive to the intrusions of man's activities. For this reason the subway alignment would appear to offer the most desired path of least intrusion where psychological and physical barriers may result with the presence of an elevated trackway. This is not to say that an aerial alignment could not contribute in a positive manner to the park environment. Certainly, the visual contrast between the extensive open space and a modern transit system would be vivid and to many a positive addition.

The visual impact of stations is predominately confined to the structures, built around the trackway and the parking area. For this extension, the structures will maintain a low profile as a result of below or at-grade track configurations. Parking areas will, however, occupy large parcels of land. The blending of these facilities with the surrounding environment should be easily accommodated for the Grimmer Road, Mission Boulevard, and Scott Creek station sites. This owes to the fact that these locations are surrounded by large tracts of industrially zoned property. The Irvington station will need to incorporate extensive use of landscaping into the overall design as a means of creating a more positive visual image for the station area relative to adjacent residential and commercial land-uses. An opportunity also exists to blend the Irvington station into the City's redevelopment plan for the Irvington district.

REGIONAL CONCERNS: METROPOLITAN TRANSPORTATION COMMISSION

Three additional factors were identified for the purpose of assessing the potential impacts of a Warm Springs BART extension from a regional perspective. The following is a summary of the evaluation with respect to the route descriptions and station locations presented in Parts IV and V of this report:

FACTOR 8: TRAVEL IMPACTS

As stated in Part I of this report, a prime motive for including this extension into BART's long-range planning effort was the large growth in regional travel forecast for the southern portion of the East Bay travel corridor. This phenomenon is a result of a rapidly expanding employment base within northern Santa Clara county relative to housing. Much of the growth in regional travel is expected to be accommodated by the Nimitz freeway and to a lesser degree the I-680 freeway. The primary direction of this growth is in the morning southbound direction as increasing numbers of East Bay residents commute to jobs in the Santa Clara Valley. This is a "reverse commute" situation relative to current travel characteristics. A rail extension to Warm Springs will increase the effectiveness of BART's interface with the regional freeway system dramatically. This will create a much more attractive transit link between the proposed Santa Clara express bus service and BART. The result will be a broadening of employment opportunities particularly for western Alameda and Contra Costa residents dependent on transit as the employment "rich" South Bay becomes more accessible. The Mission Boulevard station site for a new BART terminus offers excellent access to both the Nimitz and I-680. Projected traffic volumes for Mission Boulevard, however, are 66,000 vehicles per day suggesting that peak-hour congestion could significantly slow express bus speeds in this area.

The Grimmer Boulevard station site appears to offer the advantage of less traffic although this location requires more travel on local arterials. The Scott Creek station site also has excellent access to both the Nimitz and I-680 freeways and could serve as an effective regional transit transfer location. The orientation of this site although located in Fremont, is directed toward the City of Milpitas. Opportunities also exist to improve transit access between the Livermore-Pleasanton area and the Santa Clara Valley via I-680. A Warm Springs extension although not directly involved, could serve the purpose of providing a regional transit focal point where inter-county connections can be provided.

FACTOR 9 and 10: AIR QUALITY AND ENERGY USE IMPACTS

A warm Springs BART extension alone will not improve regional air quality nor reduce energy consumption to any noticeable extent. However, this improvement if implemented, would be a significant element of a regionwide transit improvement program. As such, a BART extension in this heavily traveled corridor would contribute to the total transit plan's impact. Providing better accessibility between the region's road network and rapid transit can be translated into increased energy efficiency and fewer emissions just in terms of reducing the "stop and go" effect on traffic. From the local perspective, a somewhat different picture may emerge as station access demands are re-distributed. Fremont station, for example, should experience a decline in demand as the extension stations capture a large portion of its market. Less auto and bus traffic will therefore result meaning fewer pollutant emissions in the immediate area. The additional traffic at other extension stations, however, will offset this benefit by increasing emissions in their immediate station vicinity. Considering the situation in its entirety, an extension of BART to Warm Springs is expected to contribute to reduced energy demands and reduced pollutant emissions. Autos and buses from Santa Clara will travel a shorter distance to access BART in addition to being provided with improved station access.

SUMMARY

EVALUATION FACTOR		SELECTED ALIGNMENTS				
		CENTRAL PARK ALIGNMENT ALTERNATIVES			SOUTHERN SEGMENT--SP/WP RAIL CORRIDOR	
		AERIAL OVER LAKE	SUBWAY UNDER LAKE	AERIAL AROUND LAKE	MINIMUM DEPRESSED	EXTENDED DEPRESSED
LOCAL COMMUNITY CONCERNS	LAND-USE COMPATIBILITY	In conflict with Fremont general plan on the basis of intrusion to open space.	Compatible with park environment but has been officially deleted from the City's land use plan (this holds true for all future BART routes through Fremont Central Park).	In conflict with Fremont general plan on the basis of intrusion to open space. This route is preferred to aerial over lake route.	Conforms with Fremont general plan on the basis of confining rail operations to an already established corridor.	Conforms with Fremont general plan on the basis of confining rail operations to an already established corridor.
	COMMUNITY CIRCULATION	Minimal impact. Guideway permits through pedestrian, bicycle, boat, and maintenance vehicle access.	No impact with underground operation.	Minimal impact. Guideway permits through pedestrian, bicycle, and maintenance vehicle access.	Minimal impact. SP and WP are a significant barrier even without BART. Through traffic will be accommodated per grade separation plans.	Minimal impact. SP and WP are a significant barrier even without BART. Through traffic will be accommodated' per grade separation plans.
	STATION ACCESS	(not applicable)	(not applicable)	(not applicable)	(not applicable)	(not applicable)
	CONSTRUCTION DISRUPTION	Considerable disruption estimated over a one year period. Significant noise and dust impact.	Considerable disruption estimated over a two year period. Significant noise and dust impact.	Considerable disruption estimated over a 1½ year period. Significant noise and dust impact.	Minimal traffic disruption to pedestrians, auto, bicycles, and railroads. Considerable noise and dust impact to residential areas during daytime. Three year construction time.	Minimal traffic disruption to pedestrians, auto, bicycles, and railroads. Considerable noise and dust impact to residential areas during daytime. Four year construction time.
	DISPLACEMENT	Minimal park right of way required for aerial support structures.	No displacement of park property. Minimal impact for subway approach north of Stevenson Blvd.	Minimal park right of way required for aerial supports. Will require relocation of baseball field.	No impact other than at specified station locations.	No impact other than at specified station locations.
	NOISE (assumes guideway sound barriers and uses CNEL and average hourly ratings)	Some impact to Alpha land and park particularly over lake where guideway clearance and curve are responsible for higher noise generation.	Some impact to Alpha land but less than for the aerial routes. No impact through park.	Some impact to Alpha land and to Mission Valley residential area but less than for other aerial route. Minimal through park due to slower speeds around curve.	Positive impact to those locations where rails are below grade.	Significant positive improvement between Paseo Padre Blvd and Durham Rd where rails are below grade.
	VISUAL AESTHETICS	Significant impact particularly for high structural clearance over lake.	Minimal impact north of Stevenson Blvd. No impact south of Stevenson Blvd.	Significant impact but to a lesser degree than for the aerial route over the lake. Skirts perimeter of the park.	Minimal impact south of Durham Rd. Positive impact north of Durham where rails are to be below grade.	Minimal impact south of Durham Rd. Significant positive impact north of Durham where rails are to be below grade.
REGIONAL CONCERNS	TRAVEL ACCOMMODATION	A Warm Springs BART extension is expected to capture a sizeable portion of the large growth of regional travel forecast to occur in this corridor. Vastly improved freeway access in conjunction with Santa Clara transit improvements will establish a much more attractive transit link between the San Francisco-Oakland regional core and South Bay communities Opportunities also exist to improve transit access between the Livermore-Pleasenton area and the Santa Clara Valley via I-680. A Warm Springs extension station (the BART terminal) would provide a focal point for regional transit where inter-county transfers could easily be accommodated.				
	AIR QUALITY	A Warm Springs BART extension alone will not significantly improve the region's air quality. The number of vehicle miles generated by automobiles which the extension is projected to capture is insignificant compared to total regional travel. This project in terms of a total transit package however, should account for significant incremental benefit.				
	ENERGY USE	(Same as for Air Quality)				

EVALUATION

EVALUATION FACTOR		SELECTED STATION SITES			
		IRVINGTON	WARM SPRINGS ALTERNATIVES		3 STATION LINE
		WASHINGTON BOULEVARD	GRIMMER BOULEVARD	MISSION BOULEVARD	SCOTT CREEK ROAD
LOCAL COMMUNITY CONCERNS	LAND-USE COMPATIBILITY	Conforms to Fremont general plan which identifies a future rapid transit station at this location	City's general plan does not show a rapid transit station at this location. This site, however, is compatible with surrounding industrial land uses.	Compatible with surrounding land-use. Fremont general plan, however, shows station site in the vicinity of Mission Blvd and Warren.	City's general plan does not show a rapid transit station at this location. This site however, is compatible with surrounding industrial land uses.
	COMMUNITY CIRCULATION	Surrounding residential areas provide strong ped-bike access demand. Assumes local bus improvements generating 30 to 40 peak hour buses at station	Very little ped-bike access. Strong transit access demand from Santa Clara county at 50 to 60 peak hour buses at station (includes local buses) Good GM plant access.	Very little ped-bike access. Strong transit access demand from Santa Clara county at 50 to 60 peak hour buses at station (includes local buses) Good GM plant access.	Very little ped-bike access. Strong transit access demand from Santa Clara county at 50 to 60 peak hour buses at station (includes local buses).
	STATION ACCESS	1055 auto trips during each two hour peak period. 1655 auto trips during off-peak. 1200 parking spaces total with 900 required for morning two hour peak.	685 auto trips during each two hour peak period. 1300 auto trips during off-peak. 1000 parking spaces total with 620 required for morning two hour peak.	685 auto trips during each two hour peak period. 1300 auto trips during off-peak. 1000parking spaces total with 620 required for morning two hour peak.	(A three station extension has not been analyzed. Indications are that this sta- would generate similar levels of traffic as Mission Blvd)
	CONSTRUCTION DISRUPTION	Significant impact. Some noise and dust within commercial and residential areas.	Minimal impact. Some noise and dust within industrial areas.	Minimal impact. Some noise and dust within industrial areas.	Minimal impact. Some noise and dust within industrial areas.
	DISPLACEMENT	Depressed rail right of way would result in some commercial displacement even without BART. Two businesses would be removed.	Presently undeveloped agricultural land to be rezoned industrial this summer.	Primarily undeveloped industrial lands. Two residential properties would be displaced by the station.	Undeveloped industrial lands. One existing business would be removed.
	NOISE (assumes guideway sound barriers and uses CNEL and average hourly ratings)	Minimal impact from added auto/bus traffic due to high ambient noise levels form SP/WP, Washington Blvd, Osgood Rd. and Fremont Blvd.	No impact. Within industrial land-use area.	No impact. Within industrial land-use area.	No impact. Within industrial land-use area.
	VISUAL AESTHETICS	Low profile due to depressed rail right of way. Landscaping will minimize parking area impact.	Minimal impact. Within industrial land-use area. At grade alignment ensures low profile.	Minimal impact. Within industrial land-use area. At grade alignment ensures low profile.	Minimal impact. Within industrial land-use area. At grade alignment ensures low profile.
REGIONAL CONCERNS	TRAVEL ACCOMMODATION	Analysis of travel data indicates that a two station extension to Warm Springs is expected to accommodate 12,000 average week-day trips. Of this amount 3,200 would be new BART trips resulting from increased system accessibility. The remaining 8,800 trips are diverted trips from the Fremont station to the new extension stations. Patronage for a three station extension to Scott Creek (near the Alameda-Santa Clara county line) has not been analyzed.			
	AIR QUALITY				
	ENERGY USE				

The implementation of transportation facilities is primarily a result of a perceived deficiency. This holds true whether considering a new foot path between a rural village and a water source or for a rail line linking a suburban community to a central city. The decision in each case involves a judgemental evaluation of the proposed facility's usefulness relative to the effort required to put it in place. Implicit in the evaluation is the element of the future mainly in terms of a project's fit within a desired pattern of living space. If it is to be useful it must be used; with the decision to implement largely based upon some level of expected patronage.

For a Warm Springs BART extension, the projected patronage is based upon the kind of land-use and travel data presented in Section II of this report. Briefly, this considers the growth in total travel over a defined network as realized by future patterns and concentrations of people and various activities (jobs, recreation areas, shopping centers, schools, hospitals, etc.). Three recent travel forecasting efforts using this basic approach were used as the basis for estimating future rail extension patronage. These include:

- MTC Air Quality Maintenance Plan travel forecasts
- Regional Transit Travel Projections Project
- MTC regional travel forecasts for the Santa Clara Valley Corridor Study.

In addition to these sources, the BART data acquisition system (origin-destination fare gate data) was used as a source of historic and current rail-travel patterns.

Weekday train service assumptions for the extension include six minute service between the hours of 6 am and 7 pm via alternating Richmond and Daly City trains. Two additional peak hour Daly City-Fremont trains would result in 5 minute service over the extension for these periods. After 7 pm the system would be phased into two line "X" service with a resultant Fremont line train frequency set at 15 minutes until the 12am system closing time.

BART records indicate that the average 1978 daily patronage for the Fremont station is approximately 7,800 trips. This figure includes both entrances and exits at the station and can be thought of as 3,900 people producing two trips each. By the year 1990, assuming modest bus access improvements and parking expansion, weekday patronage is projected to reach 14,800. This is about a 6% annual growth over the next 11 years. Proportionally, the Fremont station is expected to capture a slightly higher percentage of the total trips on the system in 1990 than under current conditions. The station presently accounts for 5.3% of BART's 147,000 weekday trips. The 1990 forecast without a Warm Springs extension indicates a slight increase to 5.8% based on a systemwide weekday patronage of 254,000 trips.

With a rail extension to Warm Springs, much of the current demand as well as the future growth for the Fremont station, will be redistributed to the new extension stations. The net effect will be a gain of 3,200 weekday trips with the added accessibility provided by the extension service.

WARM SPRINGS EXTENSION PATRONAGE SUMMARY

BART System Element	1978 Avg. Weekday Patronage	1990 Avg. Weekday Patronage Without Extension	1990 Avg. Weekday Patronage With Extension
Total BART System	147,000	254,000	257,200
Fremont Station	7,800	14,800	6,000
Irvington Station	-	-	6,500
Warm Springs Station	-	-	5,500
City of Fremont Total	7,800	14,800	18,000
Warm Springs Extension Incremental Trips			3,200

Extension service passenger revenues are a result of new travel generated by the extension in conjunction with a fare schedule. For relatively short extensions, such as the one being studied, passenger revenues can be estimated by applying an average fare for travel involving the extension stations times the patronage increment for the new service. Consideration must also be given to "former" Fremont station trips which are now forecast to use a new extension station (and subsequently are associated with a higher fare). Using BART DAS information, average fare and revenue assumptions were formulated. The primary assumptions include:

- Patronage data as presented on page 77.
- BART fare structure as of fall 1978.
- An average Fremont station fare of $1.10 as determined by BART DAS.
- An average extension station fare of $1.20 based on mileage charges under the assumed fare structure.

Under these assumptions, it is estimated that a 2 station Warm Springs extension would generate $1.47 million annually in new revenue to BART. This revenue is generated by new BART travel (3,200 trips per average weekday) on the extension. When diverted trips are considered, the two extension stations are estimated to generate $4.43 million in passenger revenues annually.

ANNUAL PASSENGER REVENUES

(millions of 1979 dollars)

Basic 71-mile BART System	54.67
Basic System with 2 Station Warm Springs Extension	56.14
Incremental Revenue	1.47
Total Revenues Collected at 2 Extension Stations	4.43

The costs associated with an extension to Warm Springs are of two basic types. The first is the one-time expenditure for capital and construction of the line, stations and all other support facilities. The second type is for maintenance and operations and is expressed on an annual basis.

CAPITAL COSTS

Capital and construction costs for the extension were estimated by BART engineering staff. Costs are in 1979 dollars and represent the expenditure for 40 years worth of fixed facilities and rolling stock. Baseline costs for the extension assume the aerial direct route through Fremont Central Park and the minimum depressed rail corridor in the southern segment. Incremental costs associated with the other park alignments and the extended depressed rail corridor are identified separately. These latter costs must be added to the basic extension capital costs to arrive at a total cost for the various alternatives.

ROLLING STOCK NEEDS(1)

	2-STATION EXTENSION	3-STATION EXTENSION
A CARS	10	13
B CARS(2)	44	51
NEW TRAINS (at 6-minute headways)	4	5

NOTES:

(1) The car requirements presented here are for a first buy expected to last 30 years. The number of cars needed for a 40 year capitalization program requires that these figures be multiplied by 1.333.

(2) To provide capacity to meet the projected peak hour demand at a 1.3 load factor requires that 10 of these B cars be added to "existing" Richmond/Fremont trains. The remaining new B cars are for the additional trains required as a result of the extension.

CAPITAL AND CONSTRUCTION COSTS

	COSTS IN MILLIONS OF 1979 DOLLARS		
	4.8 Miles - Irvington and Grimmer Stations	5.7 Miles - Irvington and Mission Stations	7.1 Miles - Irvington, Grimmer & Scott Creek Stations
A. BASELINE COSTS (aerial direct and minimum depressed alts)			
1. Right of Way - Line and Station	4.2	4.9	6.2
2. Construction - Line and Stations, civil and structural, architectural, landscaping, E/M equipt.	53.6	57.2	69.5
3. Train Control	4.5	4.6	6.4
4. Track Electrification	7.7	8.3	10.8
5. Communications	0.9	1.0	1.4
6. W.P.R.R. Relocations	22.4	23.3	24.9
7. Rolling Stock	51.2	51.2	60.8
8. Subtotal Contract Work	144.5	150.5	180.0
9. Insurance (1.5%)	2.2	2.3	2.7
10. Engineering & Construction Management	11.5	12.1	15.2
11. Contingencies (10%)	15.8	16.5	19.8
12. BASELINE TOTAL	174.0	181.4	217.7
B. ADDITIONAL COSTS FOR OTHER ALTERNATIVES*			
13. Aerial Indirect Route (+2.4)	176.4	183.8	220.1
14. Subway Direct Route (+19.5)	193.5	200.9	237.2
15. Extended Depressed Corridor (+25.6)	199.6	207.0	243.3

*These three additional elements can be combined with the baseline case, line 12, as well as with each other to form higher cost alternatives.

OPERATING COSTS

All costs associated with providing transit services over the extension were determined using current cost allocations and estimates as they apply to BART service increments. The costs vary depending upon the length of track added and the number of new stations assumed. These are identified in the following table.

ANNUAL OPERATING COSTS (in millions of 1979 dollars)

	EXTENSION ALTERNATIVES		
	4.8 Miles - Irvington and Grimmer Blvd. Stations	5.7 Miles - Irvington and Mission Blvd. Stations	7.1 Miles - Irvington, Grimmer & Scott Creek Stations
1. Direct Operating Costs- power, train operator and vehicle maintenance	2.32	2.76	3.42
2. Station Operations	0.45	0.45	0.68
3. Direct Support Services - police, line supervision, etc.	0.41	0.41	0.61
4. Revenue Collection	0.10	0.10	0.15
5. Maintenance of New Track	0.14	0.17	0.21
SUBTOTAL	3.42	3.89	5.07
6. Insurance (2%)	0.07	0.08	0.10
7. Direct and Indirect Administrative Costs	0.28	0.28	0.41
8. Contingency (10%)	0.38	0.43	0.56
TOTAL	4.15	4.68	6.14

This study has presented possible BART extension alignments and station locations based on a set of general planning and design related issues. Many aspects of a BART extension in this corridor were not addressed since the study objectives channeled the effort within specific areas. These included an estimate of costs and a general assessment of impacts associated with the various alignments. Follow up efforts will need to focus on a number of issues regarding the adoption of a specific route and its implementation. This means, for example, that the issue of BART in relation to Fremont Central Park will need to be resolved. This study has identified three possible routes through the park in response to the City's goals as well as BART operation and design criteria. The same holds true for the depressed rail corridor where the City's goals to enhance its livability point toward a solution which may negatively impact the Southern and Western Pacific Railroads. Contingent upon how each of these and other issues are resolved is the related aspect of cost sharing. This is particularly true with regard to right of way since a BART line would share a space within an improved rail corridor. Extensive on-going discussion will be required in order to identify specific areas of responsibility and establishing a clear course of action for the implementation of this BART extension.